JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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VOL. CVI., No. 2397.—TUESDAY, APRIL 20, 1909.

EDITORIAL NOTES—GAS, &c.

Past Coal Lessons, and Present Effects.

THE futility of the coal owners entering into any undertaking among themselves, especially on a falling market, to maintain the price of gas coal at a higher level than the conditions of coal demand and trade generally warrant, has been demonstrated in striking manner during recent times. The lessons of the past two years have not been lost upon them; but we should not have referred to the matter just at this particular season, were it not that they are again counselled to take the same action that put a number of them in the North into an uncomfortable position in 1907 and in more southerly counties in 1908. The coal owners, we think, will be content to let matters rest as they are, and to continue, as they have been doing this year, securing gas coal contracts in open competition without their hands being tied by agreements or understandings in any way. The "Iron and Coal Trades Review" is the counsellor that, in the following sentences, hints that some agreement as to contract prices would probably now be useful:

> **There do not appear to have been any general meetings of gas or house coal proprietors as yet this year to agree upon the contract figures; and, as far as we can hear, none has been called, although it is under such circumstances as those now prevalent that some combined action would appear to be more useful than when the market is naturally strong. Last year, however, when trade was in a decidedly better position than it is now, the understanding entered into was not always adhered to; and perhaps it is thought that little cohesion would be possible this year, and that, therefore, the less said the better.**

The advice comes rather late in the day, when so many important gas coal contracts have been settled for next year; and had it been given before, the coal owners would, we opine, have taken precisely the same course of independence that they are now doing, and for the reasons that are reflected in the last few lines of the quoted paragraph. When the market was in a strong position in 1907, and there was very largely coherent action in the more northerly English coal-fields, certain coal owners viewed with anything but pleasant emotions the slipping from their grasp of considerable contracts to which they had been accustomed, and their placing elsewhere; nor did they contemplate with equanimity the splitting-up of contracts and the scattering of parts into quarters that had before never been favoured with such orders. The (so to speak) mobility of the gas industry in respect of anything but negligible portions of its coal supply was a new-born experience. In the early part of last year, we heard of the Gas Coal Federation, of the "machinations" of the gas companies, and of the collieries uniting in "insisting" upon 2s. to 2s. 6d. per ton advance upon the 1906 prices. How far the "insistence" was carried is a matter of history. It was ultimately every coal proprietor for his own hand, and not a repetition of the 1907 experience for many of them. To say, as our contemporary does, that the "understanding entered into [in the "spring of last year] was not always adhered to" is the barest of possible acknowledgments of some of the actual occurrences of the contract period. The 2s. and 2s. 6d. per ton advance on 1906 could not be commanded or enforced; and resolutions, insistence, and so forth all came to grief, where buyers did not madly rush in, on the rocks formed by the resistance of the gas industry to unfair treatment and by the market-ruling conditions of the times. The coal owners are philosophic in having, in their individual capacities, arrived at the conclusion that, if there was little value in "combined action" when the market was stronger than it is now, there would be still less to be gained by troubling to agree among themselves a price in days such as these. The loss of contracts formerly possessed has ever a mortifying effect upon the most ardent of commercial spirits.

The coal contracts of the gas industry rank well in the eyes of the coal owners, not only on account of their volume, but because of the steadiness of requirement season by season. And notwithstanding the competition of electricity, the demand is an ever-increasing one. The Board of Trade returns indicate this. More gas is produced to-day per ton of coal carbonized; and the use of water-gas plant has not by any means diminished since 1902. Even so, the quantity of coal carbonized for gas making, by the statutory undertakings alone, increased from 14,109,219 tons in 1902 to 14,846,257 tons in 1906, which is the year of the last published returns. This is an increase of 737,038 tons; and it is worth noting that 365,932 tons of this is the advance of 1906 on 1905. In 1906, the statutory gas industry used 2 million tons more coal than the whole of the railways of the United Kingdom did in 1907, and an amount equal to upwards of two-thirds of the total used at the blast-furnaces of the United Kingdom. From which it is seen that the gas industry is entitled to not a small measure of respect; and the industry is not to be found at any time in the humour for being trifled with by those with whom business is done. Though there are those who would put the coal proprietors and the gas industry again into two hostile camps, it is hoped that the free competition of the present time will continue, without the disagreeable incidents and friction produced by the restriction, in the initial negotiations, of resolutions that, by the force of competition and individual interests, have in the end to be sacrificed, however honourable the original intention to stand to the verbal bond.

It is known that many important gas coal contracts have already been settled this year. As far back as February, statements were publicly made by prominent Chairmen as to contracts having been entered into at "materially lower "prices" than those of the previous year, and a decrease of 12½ per cent. was also mentioned for three or four companies. Apart from the general knowledge as to the position of the country's trade, the keenness of the competition among the coal trade representatives for the contracts for the ensuing year well before the customary period, was indicative of the ruling conditions; and there has been no lull in the competition. It will from what has been said be quite obvious to those who are still negotiating that the prices circulated as market quotations for gas coal are anything but stable. Many contracts, we know, have been settled at figures below those cited by market reporters, and not only for gas coal but for the steam coal required at electricity generating stations. In the North, the Newcastle-on-Tyne Electric Supply Company have entered into their contracts at prices similar to those paid in 1906; and in the South the Brighton Corporation Electricity Department are paying 2s. 8d. less per ton than the last two years. The difference between gas and electric lighting undertakings in connection with the reduced expenditure for coal that will accrue under the new contracts is that the greater part of the saving in the case of the former will go to the gas consumer; in the case of the latter, the money is badly wanted by many of them to assist over the critical time through which they are passing.

In considering the position of the coal market in the more immediate future, there are several contributory influences to be gathered together. The cloud of trade depression does not appear to show any disposition to disperse in a hurry; and the situation is anything but favourable to the coal owners and the miners in respect of the coming into operation of the Coal Mines Eight Hours Act. Its provisions will apply to all the coal-fields save Durham and

Northumberland on July 1 next; and to these counties on Jan. 1 next year. It will be remembered that the Act provides for an eight-hour day excluding windings; but there are few outside the coal industry who really recognize the upheaval there will be in practices and customs in the different coal-fields by the incoming of the Act. One well-instructed writer in these matters points out that in South Wales, the men now work four long days of ten hours and two short days of eight hours; in Lancashire, many of the pits have worked from nine to ten hours on five days of the week; and in Durham and Northumberland, the coal hewers have been working less than eight hours a day, but the boys and labourers have been working nine to ten hours, serving two sets of hewers—this being found an economical mode of proceeding. For gas undertakings supplied by coal-fields other than Durham and Northumberland, it is a very good thing the Act comes into force in the light season of demand; but in respect of Durham and Northumberland, there will be much fervent hope that the Act will glide into operation on Jan. 1 next, in the midst of the great consumption period, without causing any dislocation of supplies. It is a matter that will be worth looking into betimes. The point germane to the subject in hand is that the Act is not likely, under the stress of present adverse conditions, to be instrumental *per se* in producing any immediate turn of prices in the upward direction, though the miners themselves are not lying dormant in the matter of employing every available factor, in face of the steady decline in wages of late months, in getting the basis of wages raised. If true, however, a rumour current last week bodes no good. It was to the effect that some form of taxation generally on coal, and not on exported coal alone, would be proposed by the forthcoming Budget. The impression seemed to be that 2d. per ton duty would be levied at the pit mouth on all coal, and that there might be a further tax on royalties. But it is all nebulous talk at the moment. On the quantity of coal raised last year—261,500,000 tons—a tax of 2d. per ton would yield just about the same sum as was produced by the 1s. tax on exported coal in the last complete year it was levied—£2,180,000. The loss of this money to the national exchequer since 1906 has been keenly felt; and there will be much resentment against the Government if it is attempted to now replace the money by taking five-sixths of it, or thereabouts, from the pockets of home consumers.

Contemplating further the immediate future, the export figures referring to gas coal in the first quarter this year are significant. On coal exports generally in the quarter, there was a shrinkage of no less than 347,000 tons compared with the corresponding period of 1908; and of this gas coal—the quantity shipped being 2,187,549 tons—accounted for 252,101 tons. This large proportion of gas coal in the decline is of importance to home buyers; and there are reasons for it which cannot be attributed to the conditions of the British coal market. While there has been this decrease of 252,000 tons in the gas coal shipped, the quantity of anthracite exported has been about 60,000 tons more, household coal about 32,000 tons more, and other sorts about 42,000 tons more; while steam coal decreased by about 94,000 tons. That the price of the gas coal has nothing to do with the decline in its export during the three months is seen by the fact that the value of the quantity shipped —£1,131,209—was £315,348 less than in 1908. In other words, the quantity of coal exported was greater in the period of high prices than it is in the period of low prices. Nor can it be said that the decrease in demand is due to a diminution of gas consumption on the Continent. There is little doubt that it is owing to a variety of native causes, among which are the greater tranquillity in the Westphalian and French coal-fields, with the greater resort of the German and French gas-works to these sources of supply, and to the fact that the new systems of carbonizing on the Continent permit of more extended use being made of the cheaper varieties of home-produced coal. In view of this, much care should always be taken to specify the coal from which published carbonizing results are obtained. Some of the improved yields per ton of which there has been note made in this country during the past year, are partly due to the return from the poorer qualities of gas coal used in 1907 to the higher grades in 1908. Altogether, the position of affairs in the coal market is both interesting and instructive; and it is observed that, on all hands, the coal proprietors find themselves obsessed by sensitive conditions calling for the exercise of diplomatic treatment.

The Coalite Curtain Partially Lifted at the Plymouth Gas-Works.

THERE have been private visits to the installation of coalite plant at the Plymouth Gas-Works during the past few months by special permission of the British Coalite Company. But last Thursday the plant was thrown open for the first time to a formal inspection by gas managers; and this distinction was conferred upon the Cornish Association. Professor Vivian B. Lewes and Mr. Charles H. Parker, the son of the originator of the coalite system, were there to receive the visitors on behalf of the proprietary Company; and, of course, Mr. P. S. Hoyte, the Engineer and Manager of the Plymouth Gas Company, was also present to give cordial welcome to his *confrères*. Our local correspondent was among the visitors; and he generally describes, in an article in other columns, the plant, his own impressions, and certain details as to working picked up by the way during the inspection. He tells us that the advantages of low-temperature carbonization were demonstrated to the visitors; but, after reading the article, it is manifest that the disadvantages were also demonstrated, and that the practical gas managers from the extreme south-west of the country went away from the works quite undeceived as to which predominate in the system—the disadvantages or the advantages from the gas man's particular point of observation. The visit, however, has not by any means given gas men all they want to know about the coalite plant, its operation, and its working results. But it has lifted the veil a little; and what is seen does not mitigate doubts, nor detract from the estimates already made as to the extent of the value of the system to those whose primary business it is to make and sell gas.

As our readers are aware, the original laudatory advertisement articles that appeared in the public Press, the Cantor Lecture in which a famous and popular lecturer made himself responsible for divers remarkable assertions and computations, and the promotion of the British Coalite Company, were all founded on plant and a method of operation that subsequently had to be discarded; and why? Because the much-vaunted process as then designed and operated would not produce the substance that is known as coalite. Carbonizing the coal in masses at the low temperature of 800° Fahr., with three-and-a-half to four hour charges, there were, as any practical carbonizer would have expected, considerable physical differences between the outside and the inside portions of the mass of stuff discharged at the end of the carbonizing period. There was such disuniformity that part was coke, and part was practically still coal; but it was certainly not "coalite" throughout. Is it not possible that the defamed assumptions of the past—for they could only have been assumptions, in view of the enforced rejection of the original plant and practises that would not consistently effect the results claimed—will have as a companion in their final resting-place Professor Lewes's financial computation as presented, with much garnishing, to a Society of Arts audience some twelve months since? That financial computation was in itself a work of art; and there will be some difficulty in supporting it now under the altered "invention" and system of operation. Readers will be interested in examining the catalogue of plant presented by our local correspondent, comprising the coalite installation at Plymouth. What is there in the combination different from gas-works plant save the castings of twelve small tubes, 32 of which castings form what is called a battery? Even to the governor on the foul main, the similarity to modern gas-works practices is carried. And what is there different in the method of working from the intermittent vertical retort system, save that the coal is carbonized in thin cores in the nests of iron tubes, at a temperature of only 800° Fahr., and for shorter periods? The differences are merely of degree or quantitative. To the gas industry they will confirm what is already known of low-temperature carbonization. In their ignorance, the Directors of the British Coalite Company may conscientiously be of opinion they are doing something great and novel. But they are merely the patrons of a wild-goose chase.

However, from carbonizing in mass to carbonizing in tubes is a radical change in the system itself which has made a vast difference in the operating results. Just think. There are twelve tubes in a bunch, 32 bunches form a battery, and two batteries carbonize 112 tons of coal a day, and produce only 560,000 cubic feet of gas, or 5000 cubic feet per ton. We make out that there are 384 tubes in a battery; and, in the two batteries used, producing 560,000 cubic feet per day,

768 tubes. The charges run for four hours, which means that the 768 tubes are charged and discharged (say) six times a day. Therefore, 768 × 6 = 4608 ½-cwt. charges and a similar number of discharges in the twenty-four hours for 112 tons of coal. There is therefore during the day a great deal of opening and closing of mouthpieces and exits of these nests of vertical tubes, and much associated labour, such as the exercise of an amount of persuasion to cause the adhesive charges to leave the tubes, and, we imagine, the clearing of the lower mouthpieces. Hence there is no surprise that our local representative was somewhat struck by the number of men employed on the plant. He found three on each battery, or six on the two; and there were others engaged on the producers. We do not find that our correspondent states the number of shifts worked per day; but assuming three, this would represent eighteen men and (say) two for the producer work—making twenty in all in the twenty-four hours—for dealing, on the carbonizing plant only, with 112 tons of coal making 560,000 cubic feet of gas! And this is set up as the paragon of economic carbonization systems! Does Professor Lewes still maintain, as he did in a footnote to one of his tables in the Cantor Lecture of twelve months since, that "in the low-temperature carbonization "eleven men replace fifty men"? Or will he now suggest that the carbonizing wages come out per 1000 cubic feet of gas produced to anything like (say) the figure to which Mr. Hoyte works on his inclined retorts? What twenty men can do in twenty-four hours in a horizontal retort-house operated on modern mechanical lines is also well known to Professor Lewes. In Mr. Hayman's paper before the Institution of Gas Engineers last year, he showed that, under the Dessau retort system, the carbonizing wages (at rates of payment comparable with this country) worked out to about 5d. per ton of coal carbonized, with a ton yielding about two-and-a-half times the volume of gas for sale that a ton is now doing in the coalite plant at Plymouth—admitted, the former of lower candle power than the latter. And Mr. Harold W. Woodall calculated, in his paper on the same occasion, that by the Woodall-Duckham continuous system the cost of carbonizing labour, similarly realizing a large yield of gas per ton, would eventually be about 6d. per ton. We think some revision is required in Professor Lewes's Cantor figures for labour in low and high temperature carbonization; and it would be of interest, now and hereafter, if he would put on record the exact carbonizing figures, from the Plymouth low-temperature working, per ton of coal carbonized and per 1000 cubic feet of gas made. It is feared that the Cornish gas managers left Plymouth somewhat impressed by the disadvantage to them of the system in this particular.

It was pointed out to the visitors as an advantage of the coalite plant that it occupies less space for the weight of coal carbonized than the installation of 72 inclined retorts close by, and which are carbonizing rather less weight of coal per day. This is undoubtedly a case in which comparison should be made, from the gas-works point of view, not of the quantity of raw material handled, but of the gas product, the cost of obtaining the product, and the revenue producing power of the whole of the products. To obtain by the coalite process 12,500 cubic feet of gas (which can be produced per ton in ordinary vertical retort working) carriage is paid on 2½ tons of coal; labour is paid for to handle the 1½ tons extra coal; and naturally, therefore, as our correspondent remarks, "the elevating and conveying "plant are on a rather large scale for so small a plant." Looked at from the gas man's standpoint, there is the suggestion in this of heavy capital expenditure and wear and tear in the coal and coke handling plant, in comparison with experience under the high-temperature and high gas-production system of carbonizing.

A great point was made of the fuel account; and Professor Lewes indulged in a nautical simile to illustrate why it is that in low-temperature carbonization the fuel account only represents 5 or 6 per cent. of coal carbonized, as against (as he says) 16 per cent. in vertical retort working. This 16 per cent. rather applies to isolated trial settings, and not to regular operation, when 14 per cent. would be a nearer figure in, at any rate, the Dessau working. When the fuel accounts of the two systems are brought into relation with the gas made per ton, there is not, on the figures presented, much to choose between them.

The results of the low-temperature carbonization are stated to be 5000 cubic feet of gas of 18 to 20 candle power, 13 to 14 cwt. of partly carbonized coal (*i.e.*, "Coalite"), 22 gallons of tar, and 15 lbs. of sulphate. On this working, we should now like a fresh balance-sheet drawn up, including all the items of expense from cost of coal carriage and delivery throughout, with the revenue derivable, so that an analysis might be made on the basis of per 1000 cubic feet of gas, to enable a comparison to be effected with ordinary operation and trading. According to Professor Lewes, the plant at Plymouth has demonstrated all that has been claimed for the process. As will have been gathered from the foregoing, our doubts are such that we disagree with Professor Lewes. More information is required. Gas undertakings are not particularly partial to paying more than twice the amount that they are doing at present for the conveyance of raw material for the production of a given quantity of gas, nor for labour in dealing with that raw material, nor do they want to increase their capital expenditure and their wear and tear for coal and coke handling and carbonizing plant per 1000 cubic feet, nor do they desire to employ (as it appears to us) about forty men for working on the carbonizing plant alone for producing per day a million cubic feet of gas, nor do they want to do much else that the British Coalite Company would wish them to do, and which they will not do, or even entertain, until a much better case has been presented than the one that is so far before us. Altogether, we understand better now what the late Chairman of the British Coalite Company (Mr. Albert G. Kitching) meant when he said in December last that "he and his colleagues had learned so much since the con-"tract was made with the Plymouth Company that they "had no intention of offering any other gas company similar "terms."

The uneasy shareholders of the British Coalite Company will unquestionably be pleased to learn that 75 tons of coalite are being produced daily at Plymouth, and up to the present are being disposed of. At what price? They would also be delighted to hear the actual profit per ton of coalite, after deducting all capital, raw material, manufacturing, and wear and tear expenses, and adding to coalite the revenue from gas, tar, and sulphate. If the shareholders are allowed to have these figures, it will supply the basis for a further comparison of the commercial results of (on a limited and precarious scale) low-temperature carbonization with those of (on a large and well-established scale) high-temperature carbonization. It must not be forgotten that the process is a wasteful one for gas production; and that much depends on the price of the coalite. The price of the coalite must not be put at any fancy figure, or at a figure that a comparatively few smoke-prevention zealots would be prepared to pay, in calculating prospects, but at one which will command a sale in competition with other fuels. There is ample evidence in the trading world that, no matter what the superior virtues of an article may be, if the price is higher than that of a competitor the fact puts a limit to the sale.

The Calorific Power Test.

THE writer of last week's "JOURNAL" article on "Testings "for Calorific Power," which was the subject of comment in the editorial columns, has returned to the defence of his points this week. But if he did not so persistently look upon the standard of 125 calories net as an unqualified fixture, and relegate the conditions attaching to that standard to the position of an almost negligible quantity, there would not be much difference, if any, between us. There is absolute agreement with him that a standard of 125 calories net, standing by itself, for a 14-candle mixed gas would be too high; but, as pointed out last week, the history of the negotiations between the Gaslight and Coke Company and the London County Council shows that the conditions are inseparable from the standard, and must be read as an integral part of it. The 125 calories net without the conditions would, it has been made abundantly clear by the Company, have been discarded by them as impossible. Regarding the agreed standard as a precedent, the conditions must be taken as an essential part. We cannot, of course, answer for the future views of the London County Council; but they cannot by any twist of the imagination construe the terms of their agreement as representing a "stringent standard" of 125 calories net. Speaking offhand, but keeping in view the value of the lower limits in times of stress (just when ample latitude is a consideration), we prefer the margin offered by the present standard between 125 calories and 112½ calories, with a permissible further lapse bordering on 6 calories on one day, providing the average of three days is not below the

limit of 112½, than the narrow margin suggested by our correspondent—that is, between a standard of 120 calories and 115 calories as the forfeiture point.

The writer of the article says that, "if the standard of 125 "calories is *merely one to be maintained as an average*, and is not "fixed with the same intention as the illuminating power "standards have been in the past (to be exceeded on all but "exceptional occasions), then there would be little cause for "apprehension." The terms indicate that the standard of 125 calories is not "merely one to be maintained as an aver-"age." It is a point to work to. The "average" is to be reckoned at 10 per cent. below that, with a time limitation of three days over which the figures to be averaged may extend. Respecting the latter part of the quoted lines, there is not the same danger of the calorific power depreciating between works and testing-stations and consumers that there is in the case of illuminating power; and therefore the same protective excess that there has perforce to be in illuminating power will not require the same representation in calorific power. As to the remark of the writer of the article that "an instrument such as a calorimeter may be faulty for a "considerable time before the fact, and the nature of the "fault, is discovered," there are so many instruments in use in the London testing-stations, and tests are made at each station day by day, that any serious variation in the returns of an instrument on any day, or succession of days, must strike an examiner as irregular, and induce an inquiry on his part as to whether the instrument is in fault. The official tests over the past two years and more do not show the variation in returns that suggest any "considerable time" passing before a fault in the apparatus is discovered.

On the whole, the official tests commend themselves as creditable both to the Gas Companies and to the instruments. At the same time, we do not hold the instruments up as either infallible or beyond improvement. It has, in fact, been acknowledged in the "JOURNAL" (Dec. 29, p. 888) that the Boys calorimeter was designed for the testing of gas of very limited range in calorific value, and that it is a pity its scope should be restricted by its present hard-and-fast proportions and construction. In view of this feature of its design, makers of water gas may not find it of that general service they desire for works' purposes. Scope for error, however, is also to be found in the user of this or any other calorimeter, and in his calculations of the net value from the gross.

Reformation of the Street Lamp.

Is the best use being made of the opportunities of the day in the matter of the improvement of the appearance of the means by which lighting by gas is performed? Inspection of the standards and lanterns used in several towns induces an opinion on the negative side; and it is feared that, unless there is an alteration, this will as time passes prove exceedingly detrimental to the interests of gas lighting, and be used as a fair reproach when creating disfavour towards gas and favour towards electricity. Having regard only to the aspect of the question of public lighting to which particular consideration is now being given, and not to the fact that possession stands for much (though not for so much through municipal ownership of electricity undertakings as it would otherwise do), the age of street lighting by gas is somewhat to the disadvantage of the illuminant, in that there are on the hands of gas undertakings or the lighting authorities classes of lamp-posts and lanterns whose style and suitability to purpose bear the impress of antiquity—the period of design being one when the amenities of the streets were but vaguely considered, when a rigid plainness and sameness of lamp structure ran through the country, and when efficiency and effect of the structure for the destined purpose were not thought out with critical care. The old lamp columns and lanterns, save in some places in the main thoroughfares, are being perpetuated now by patching adaptation, though the time is favourable for beginning to make a sensible change.

When these old lamps were being converted from flat-flame to upright incandescent burners, there was less room for warning than there is now; but the conversions of those times accentuated the ugliness of the old quadrilateral lantern, and the objections to its four ribs and the frame of the square bottom, which when the lamp was alight threw heavy diagonal shadows across the roadway, from a dense square of shadow at the foot of the standard. These shadows were intensified by the introduction of incandescent gas mantles; the greater the candle power, the greater the depth of shadow. The only good thing to be said about the shadows is that they have had with incandescent burners more stability than they had with the flickering open flames of the batswing era. At the time of the change from the low efficiency to the higher efficiency lighting of the incandescent mantle, Sir George Livesey grasped, and thankfully, the opportunity for doing away with the quakerish and ineffectual public lamps of the flat-flame *régime*. Sir George has been charged with being in his works a despiser of the ornamental, and with being obdurate in drawing the line in expenditure at the point where utility ends. In his works, in his person, and by his words, he declared in his day what most people believed of him. But this was the one thing in which his soul was not precisely represented by his acts and words. No man ever revelled in Nature's beauty, and no man admired and had an eye for the picturesque, more than he. When, as we say, there was change from the old system of lighting to the new in South London, Sir George consulted professors in the art of lamp column and lantern design, and he even put artists on the job. All with no effect—the former he declared to be limited in their conception by custom and tradition, and the latter to be all for the ornate and with no idea of utility and practicability. So Sir George set to, and himself designed the "Eddystone" lamp column, of graceful curve, but destitute of the nooks and crevices that give harbourage in many other designs to dust and rain. He also designed a lantern that avoided certain of the defects of the old four-sided one with its amplitude of light-disturbing framework. The new lantern being trilateral in form, with slightly curved panes, the shadows of two of the three ribs followed the line of the gutter at the side of the road, and so were almost unnoticeable. What Sir George did in this matter formed the most extensive departure at the time from ancient types of column and lantern, in any area of the country.

In the application of the inverted gas-burner to street lighting, a good opportunity is again before the gas industry. But we are sorry to see that the propensity persists in many places for adapting the ancient types of lantern to the new burners, to save expense and, as incidental to parsimony and patching, perpetuate the reputation for ugliness. Remember the utility of the street-lamp is for the night; its appearance for the day. The streets have greater use made of them during the hours of daylight than during the hours of darkness, and for a much greater number of hours. During those hours of daylight day by day, upon the eyes of the multitudes traversing the streets the appearance of the gas standards and lanterns falls, and in the majority of cases that appearance is not impressive. Even when fitted with an inverted gas-burner, the combination of the ancient and the modern is not striking—in some cases, to look upon, it is positively hideous, The gas industry has to do its part in altering this state of things. The trend of the times is to town betterment. The standard in this respect has been very materially raised. The architectural features of our cities and towns have largely changed. The process is continuing; and local authorities are constantly scheming some fresh improvement. The public lamp is a feature of street equipment; and it must not be behind. It must be a thing not of reproach to gas, and not a standing suggestion of an obsolete system of illumination. The street lamp in its outward form has not advanced with the advance in efficiency of the system of gas lighting. But the inverted gas burner comes to our assistance in this matter of adding to the picturesqueness of the streets. With a gracefully curved swan-neck attached to the tops of the old footpath standards, or a harp-shaped extension of refuge standards, and an inverted burner lamp suspended from the adaptor, it is wonderful the change effected in the appearance of the columns and of the street. The impression of stuntedness and old-fashioned types is thus readily removed.

We quite appreciate that this means expenditure; we appreciate, on the other hand, that in these times the gas industry is largely fighting lighting authorities who are closely allied to the electrical competitor; and we further appreciate that the public must be pleased, and not be allowed to become influenced by the notion that in the matter of appearance—æsthetic or artistic, or whatever other descriptive term may be considered apposite—the gas-lamp is unfitted to stand in the same street as the electric lamp. Apart from the questions of efficiency and cost, the pendant arc lamp from the curved top of a standard takes us completely from the past in street illumination. In a measure, notwithstanding the cumbrous nature of most arc lamp columns, and the heavy

appearance of the arc lamps themselves, the change from the ubiquitous straight-lined lantern and standard of the past pleases the eye. The same—and we may claim more—effect can be got out of the gas-lamp column, by adaptation, and the use of suspended inverted gas-lamps, which are not so heavy looking nor so long as the electric arc lamp. This is a matter that requires serious attention. Something has been done, but not enough. A good impression is made by activity; a bad impression by negligence. It is not a question to-day of letting matters go as they will, but of making good use of opportunity, and, as far as possible, of "Taking "Time by the Forelock." Standard and lamp manufacturers might surely do a good business by making a speciality of "adaptors" for old-fashioned street lamp columns, to fit them for use with inverted gas-lamps.

There is one other point. It has been noticed in certain towns that, where the trolley-wire system of tramway traction has been installed, inverted and upright incandescent gas-lamps have been fixed on the trolley standards. The wisdom of this, in one respect, is open to some little doubt. The huge standards when set up near gas-lamps throw dense shadows, and thus completely spoil the uniform effect of the lighting. The heavy standards also add very substantially to the number of obstructions on the pathway. What cannot be helped must be endured. There is no question that, for light-diffusion purposes, with the trolley-wire standards in position, they are better supports for the gas-lamps than independent columns. But (this is the one point of doubt) there is, unless the lamps are fitted with an exceedingly good anti-vibrator device, a large destruction of mantles—inverted and vertical the same—owing to the vibration to which they are exposed throughout the car-running hours. This is the one drawback. Some constructions of lamps are not so bad as others; and, of course, situation also causes variation in results. The experience is not peculiar to incandescent gas lighting. Metallic filament lamps, especially when the filaments are cold, find the trolley-wire standard anything but a position of comfort and safety. It is, however, a subject upon which, if anyone has found any particular methods of fixing and use more favourable than others for gas-lamps supported by the tramway standards, it would be serviceable to have the particulars published in our columns.

Cooking by Gas and Electricity.

In view of the claims put forward on behalf of electricity for cooking purposes, the attention of our readers may be called to the letter from Mr. Cyril G. Davis, the Managing-Director of the Davis Gas-Stove Company, Limited, which appears in our "Correspondence" column, giving the results of tests carried out in the Company's laboratories with an electrical cooker and two kinds of gas-stoves. It will be seen that even the least economical of the latter appliances was better than the one operated by electricity.

Empties and Gas and Electricity Supply.

It has been a matter of observation in recent years that there has been a tendency to increase in the amount of unlet property in the areas of the London Gas Companies. The Chairman of the South Metropolitan Gas Company (Mr. Charles Carpenter) referred, at the last meeting, to the number of vacant shops and residences in the Company's district, and mentioned that they have 18,000 supplies on which capital has been spent in the provision of them, but which are now idle, owing to the users having departed elsewhere. Again at the Commercial Gas Company's meeting, the Chairman (Mr. W. G. Bradshaw) stated that they have no fewer than 7000 unoccupied houses in their district, and 7300 supplies which are not being used at the present time. The figures, of course, are large owing to the extent of the districts. But there is satisfaction in knowing that each year brings its addition to the number of consumers. The causes for the increase of the empties are ascribed to the migration of householders further afield owing to improved travelling facilities, to the development of new estates, and changes from old-fashioned property to that of more modern style. The local rates also suffer through this increase in unoccupied premises. In Paddington, for example—in the Gaslight and Coke Company's area—the loss to the borough revenue last year consequent on untenanted premises was equal to a rate of no less than 5½d. in the pound. What is true of the London Gas Companies is also true of the electricity supply undertakings, as was instanced by Colonel R. E. Crompton, at the meeting of the Kensington and Knightsbridge Electric Lighting Company. In the comparatively small district of this Company alone, he said they have upwards of 500 houses empty, which are wired for the electric light, and which have contributed to the Company's income in times past. This suggests that those municipalities owning electric lighting undertakings that have spent money on wiring houses must have a fair proportion of their capital lying idle, and must have some difficulty in arranging their accounts so as to show that the income from fitting-up the houses balances the outgoings associated with it. Another serious point for electricity suppliers mentioned by Colonel Crompton is the growing favour of private electric lighting plants among large users. Harrod's Stores have installed a private generating plant for the supply of their extensive establishment, and so has His Majesty's Office of Works for the supply of some of the museums.

Free Gas for Public Lighting.

In connection with the Oldham Corporation Bill, the authorities in the out-districts are likely to raise the question of the propriety of the Corporation taking the gas required for the public lighting without payment from the gas undertaking. Under an existing Act of Parliament, the Corporation are limited as to the amount of profit they may appropriate from the concern in aid of the rates; but it seems to us they violate the enactment by not paying for the gas used in the public lamps. To the value of that gas, the rates benefit. The gas is not made and distributed for nothing; and the money expended in doing this comes out of the gas consumers' pockets. What the Corporation are doing is equivalent to taking their fixed amount of profits in aid of the rates, *plus* (also in aid of the rates) the cost of producing and distributing the gas for public purposes. There are some folks who seem to think the Corporation are justified in their action; but we are of the contrary opinion. It represents unequal taxation; and we hope the out-townships will strongly contest the point in the Parliamentary Committee-rooms. There are some remarks on the subject in the "Town and District Notes" appearing in the "Oldham Chronicle" which seem to be argumentatively a bit unsteady. After saying that the Mayor is of opinion that the whole cost of public lighting might be met out of the funds of the Gas Department, our contemporary says: "No doubt it would be a pleasant thing for the ratepayers to be relieved of the direct payment [the expenses other than the cost of the gas used] for the lighting of the town, and to get something more from the out-districts; but we believe *the present system to be the equitable one*." After saying this, however, the "Chronicle" proceeds: "All the people benefit by the good lighting of the town, and *for it they should pay*. Rating them, though there are various anomalies in the system, is the best way of proportionately sharing the cost of municipal undertakings." Then let all the ratepayers pay proportionately for gas used for public purposes, and not put the charge only on to the gas consumers inside and outside the administrative boundary of the Corporation.

The Price of Coalite.

A well-known firm of coal dealers have sent a circular to those who, within their knowledge, have taken an interest in "coalite" as a fuel. These privileged individuals are offered supplies of the precious substance in this way, as (though regular quantities can be sold in certain districts) "the supply is still too limited to allow of the fuel being advertised in the usual way." The price asked is 1s. 6d. per sack; but 20 sacks are required to weigh approximately a ton. Therefore, the cost of coalite is about equal to 30s. per ton in these times of lower priced coal. Coalite, however, is swollen out in such a manner (thus symbolizing the ideas of the Coalite Syndicate and the British Coalite Company, as well as the advertisement statements of the former) that a ton occupies the same space as 2 tons of coal. The point has an important bearing upon the question of domestic fuel storage, as a cellar which will store 1 ton of coal will only accommodate ½ ton of coalite. Another important point which the privileged ones learn from the circular is that the cellar in which the fuel is shot (or at least that part set aside for the storage of coalite) should be free from coal, coal-dust, or coke. From this, it is assumed that it is essential there should be no adulteration of the coalite. Assurance is also

given in the circular that 15 sacks of coalite will last about as long as 1 ton of coal, so that "the price compares favourably with that ruling for the better class house coals." Most householders will require something more than the unsupported assertion of a typewritten circular to induce belief in all the statements. It is noticed that the circular is headed April, 1909; but the date is omitted. Should it have been the 1st?

No Special Gas Display at Shepherd's Bush.

Some time since, it was decided there should be no special appeal for funds for a Gas Section at Shepherd's Bush Exhibition this year; but there was a suggestion that, if it was thought desirable to do anything at all, the London and Suburban Gas Companies should take upon themselves the entire responsibility. It has now been definitely determined not to have any special demonstration at the exhibition this year; but the Companies concerned will content themselves with pursuing their ordinary advertising and educational propaganda in their districts. The proposition that was introduced to the electrical industry some time since, that a special effort should be made by them, has also dropped out of sight. Apparently the London electricity suppliers and the electrical manufacturers are not impressed with the suitability of a popular exhibition of the kind (to which the majority of visitors go solely on pleasure intent) for making an annual display. There is another point. The exhibition authorities did not last year encourage anything of the kind being repeated. There was a disposition on their part to grab every possible penny from the exhibitors, and not to lose an opportunity or neglect an excuse for doing so—no matter how much the latter did in hiring space and organizing an attractive show. It is probable the Gaslight and Coke Company will be exhibiting in the chemical section.

THE LIVESEY MEMORIAL FUND.

We have received from Mr. Walter T. Dunn the following list of further contributions to the fund:—

1909.			£	s.	d.
April	5	Previously acknowledged	9019	15	7
,,	8	John Niven, Clayton	0	10	6
		J. Wilson, Huelva, Spain	0	10	6
,,	13	Bromley and Crays Gas Company .	21	0	0
		Alexander Dickson	5	5	0
		Heywood Corporation Gas Committee	3	3	0
		Newport (Mon.) Gas Company . .	21	0	0
		North British Association of Gas Managers	31	10	0
		Walter Whatmough, Heywood . .	0	10	6
,,	15	Hereford Corporation Gas Committee	5	5	0
		John Witten, Gorleston-on-Sea . .	1	1	0
,,	16	Leighton Buzzard Gas Company. .	2	2	0
,,	17	Burton-on-Trent Corporation Gas and Electricity Committee . . .	5	5	0
,,	19	James Lees, Tonbridge	3	3	0
		Total	£9120	1	1

Scottish Junior Gas Association.—The general meeting of the Scottish Junior Gas Association (Western District) will be held in Glasgow next Saturday evening. The business will comprise the election of office-bearers and a lecture by Mr. H. O'Connor, F.R.S.E., on "Suction Gas."

The Weights and Measures Acts.—A report by the Board of Trade on their proceedings and business under the Weights and Measures Acts during last year has been issued. It is stated that the regulations made in 1907 appear to be working satisfactorily, and certain practical difficulties which in the first instance were raised by some manufacturers of weighing and measuring appliances are now being overcome. During the year, there was a reverification of model gasholders under the Sale of Gas Act which were deposited with the Chief Magistrates of Edinburgh and Dublin in 1860; and in appendices are given lists of standard gas apparatus verified at the Standards Office for local authorities and others, and an abstract of returns recently furnished to the Department of the number of gas-meters annually tested by inspectors. The official fees received at the Standards Office on account of testing work and the examination of candidates under section 8 of the Act of 1904, amounted to £592 4s. 6d.—an increase of £282 12s. 6d. on the amount taken during 1907. The annual reports received from inspectors show that 3,204,584 weights, 2,284,133 measures, and 614,985 weighing instruments were examined; 4,072,058 weights, 7,564,032 measures, and 375,412 weighing instruments were stamped; and a sum of £38,867 14s. 4d. was received in fees for stamping.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 174.)

It is the unexpected that always happens. Who could have foreseen that the bright close of the Stock Exchange for the Easter holiday would so soon suffer a reverse? Money was cheap as the proverbial drug; and the horrible Eastern bogey really seemed to have been finally laid. So, when the markets reopened on Tuesday, there was a great show of cheerfulness, and the tendency was quite promising. But business remained small; and soon an uneasy feeling crept in that perhaps the upward move had been a little overdone. The best prices of the day were not maintained, though Consols finished $\frac{1}{8}$ up. Next day came the news of the fresh troubles in Constantinople, and markets became very sensitive, though calm views prevailed before the close. Prices generally were lower—Consols falling $\frac{1}{16}$. On Thursday, the opening indicated steadiness; but business fell very quiet, and weakness supervened later on. Markets were uneven; but Consols were again a loser. Friday was quite a weak day, and realizations were on a free scale. Consols dropped another $\frac{1}{2}$; most of the gilt-edged quality were down; and the Foreign Market showed weakness in Eastern European lines. Things continued thus on Saturday; and everything fell in sympathy with everything else. Railways were much depressed; the Foreign Market was flat; and Consols touched $84\frac{3}{8}$—a good $1\frac{1}{2}$ below Tuesday's best. It was account week; and one small failure was announced on Wednesday. In the Money Market, the supply was abundant, and rates were easy. Discount was fairly firm. Business in the Gas Market was naturally moderate only—not getting all at once into full swing after the interval. But the ruling tendency was just as good as it has now for some time past been, and a number of issues improved on their last quotations; while none showed any counter-movement. In Gaslight and Coke, there was a fair amount of business done in the ordinary at prices ranging from $102\frac{3}{4}$ special to $103\frac{3}{4}$—a rise of $\frac{1}{4}$. In the secured issues, the maximum realized from $88\frac{1}{4}$ to 89; the preference 105 and 106 (a rise of 1); and the debenture 86. South Metropolitan was firm and extremely quiet. Transactions were marked at from $122\frac{1}{2}$ to $123\frac{1}{2}$. The debenture fetched 86. In Commercials, the 4 per cent. changed hands at 106 (a rise of $\frac{1}{4}$); and the $3\frac{1}{2}$ per cent. at 102 free and $102\frac{1}{2}$. In the Suburban and Provincial group, Alliance and Dublin old made 18 *cum div.* and $17\frac{5}{8}$ *ex div.*, Brentford new 188 and 189 (a rise of 1), Brighton ordinary 154, British $41\frac{11}{16}$ *ex div.*, South Suburban 121, ditto debenture $125\frac{1}{2}$, West Ham 119 to $120\frac{1}{4}$, and ditto preference $125\frac{1}{2}$ free. The Continental companies were very little dealt in. Imperial realized from $183\frac{1}{2}$ to $184\frac{3}{4}$ (a rise of 1), and European fully-paid 24 and $24\frac{1}{4}$. Among the undertakings of the remoter world, Buenos Ayres was done at $13\frac{1}{16}$ and $13\frac{3}{16}$, Primitiva at $6\frac{5}{16}$ to $6\frac{1}{2}$, ditto preference at $5\frac{1}{8}$, River Plate at from 14 to $14\frac{1}{4}$, and San Paulo debenture at $50\frac{1}{4}$.

ELECTRICITY SUPPLY MEMORANDA.

Certain Problems affecting Cost and Reliability—The Search for Solutions—Linking-up the Partial Remedy for Collapses—A Duplicate Generating Plant also Suggested—Plans for Cheapening: Overhead Wires for Distribution; the Stannos and Kuhlos Systems for Interiors.

The professionals of the electrical industry are doing their utmost to find solutions of the several problems that besiege them in relation to the domestic use of electricity. They have to render installations cheaper; lower the cost of the necessaries to utilization; increase the efficiency of the articles offered to the public; find a way of pegging along without materially increasing the price of current as the consumers providing the backbone of the business reduce their consumption, and therefore curtail their payments; as well as do something to ensure continuity of supply, and so avoid those disagreeable breakdowns which disturb the even tenor of the ways of the business man, upset the home arrangements, prevent the holding of, or shorten, evening performances at places of entertainment, and at times put churches into darkness before the collection has been made. This is a pretty heavy list of difficulties, and still it is not exhaustive. But with these difficulties supplementing his daily duties at the station, and his endeavours at annexing new business connections, and at remedying the complaints of existing consumers, the central station engineer need not complain that he has not enough and to spare to occupy his time and his mind.

There is no intention of calling particular attention to all these difficulties. There are, however, two or three of them which have not been referred to lately in the "Memoranda," but which have had renewed attention paid them in the electrical world. There is the question of relieving the consumer from the annoyance, business loss, and "intellectual and moral damage" sustained by the collapse of the electrical energy. This is a serious matter for electricity distributors, and it gives to electricity an advertisement that it could well do without. The experience of consumers has led many to adopt secondary means of lighting, and to advise friends and neighbours contemplating the use of electricity not to follow their own foolish example by abandoning completely the old and reliable illuminant. It is, too, a testimonial

to the unreliability of electricity that the London County Council insist upon duplicate supplies taken from separate generating stations, for theatres, music halls, and places of entertainment; and in the useful little brochure "Hints on Fire Protection" prepared by Captain J. de Courcy Hamilton, the Chief Officer of the London Fire Brigade, he says that, "in public buildings and large establishments, current should be obtained from two separate sources, or there should be available a good secondary means of lighting, such as gas or lamps." In the public interest and protection, there is not the least objection on our part to gas taking secondary place where electricity is employed, seeing that gas occupies the primary place in the majority of dwellings and other premises; and, in most places where electricity is being used for lighting, gas has considerable employment for other purposes. But, of course, electricians do not like the damaging certificate that a secondary lighting service by some other illuminant gives to electricity. That is quite natural; and therefore they have been looking round to see what can be done from their own resource to remove the stigma. The intercommunication or linking-up scheme of the London Electric Supply Companies, as ratified by Parliament last year, has been feverishly jumped at by several electricity undertakings as affording them, perhaps not immunity from any prolonged cessation of supply, but something by which to claim the increased confidence of the public. Linking-up is not sufficient to ensure an absolute continuity of supply. However well-equipped a station may be, it would hardly be likely to be of such dimensions, and have so much stand-by plant, that it could maintain its own load and take up that of a neighbouring station as well. Furthermore, one station (unlike a gas-works with large quantities of gas in store) could not on sudden demand immediately relieve the necessities of a neighbour.

Among others, we see that the Engineer of the Beckenham Electricity Department is conferring with his fellow officer of the South Metropolitan Electric Light and Power Company on the subject of linking-up the two undertakings for mutual protection in case of breakdown; and the Board of Trade have been asked by the parties to state whether linking-up is permitted in the present state of the law. The proposition is the more interesting as it is remembered that for some weeks the larger station of the South Metropolitan Electric Supply Company was, about Christmas, 1906, put out of action by a boiler explosion, the greater part of the district was without a supply of electricity, and several consumers returned with all speed to gas, which had never treated them in this manner. Since then there have been some occasional disturbances of supply in the Company's area, but not with such far-reaching consequences. Had the intercommunication scheme been in existence during those few weeks that the South Metropolitan Electricity Company would like to blot out of their history, what amount of assistance could the Beckenham electricity station have rendered to relieve the situation in the extensive area of the Company to whom the fates had been so uncharitable? The Local Government Board are also taking notice of these failures of electricity supply; and, at a recent inquiry into an application for a loan of £12,520 for extensions at the Keighley electricity station, the Inspector (Mr. H. Ross Hooper) urged the desirability of providing against a possible breakdown by having a duplicate alternating generator, and of increasing the sum to be spent on mains. His suggestion was that the amount asked for should be enlarged by £10,000. Of course, the argument against this is that stand-by plant largely increases the capital charges without, though protective, being productive, and that this would be an additional source of outgoing that would necessarily make itself felt in the tariff to consumers. But in any public service upon which so much depends, such as artificial illumination, assurance of constancy should be made at almost any cost.

Turning from this matter to the question of cheapening the supply of electricity by lightening the external charges for distribution and the internal ones for installation, there has been a revival of the advocacy of overhead distribution wires, and several proposals for cheapening the wiring of consumers' houses. There are not a great number of electrical engineers who are favourable to aerial wiring for distributing electricity for lighting; and really there is no sufficient public necessity to be served, nor a sufficient public demand to be met, to grant to electricity distributors the right to cause the streets to be more hideous than they are in many places being made at present by the trolley system of tram traction, supplemented by, in main streets, the huge standards for arc lamp lighting. We have commented on this matter in the past in relation to the whilom argument in which electricians were wont to delight, as to electric arc lamps minimizing the hindrances to traffic in the streets by reducing the number of gas-lamp columns. Who are the bigger sinners now—electricians or gas men—with the trolley wire system so extensively the vogue? Upon this comes the advocacy for overhead lighting wires for the sake of cheapness. There are a few (we have not heard of many) who are wroth with the Board of Trade for refusing to allow the running of wires overhead for the supply of electricity in Farnham. Harder things have been said of the Board of Trade over this matter than the occasion justifies; and so antique an epithet as "grandmotherly" has been hurled at that admirable representative of bureaucracy for damning the scheme by withholding consent. The "Electrical Review" cruelly slaps in the face this important, but "grandmotherly," department of our national government by reminding it that consent is given to overhead wires for tramway, but is denied for lighting, purposes. The apparent inconsistency is made the subject of light ridicule by our contemporary. The inconsistency looked at through the public glasses is not so great as it appears to the electrical eye. The tramways are a public convenience—used by the rich and the poor alike; and a convenience that continues its usefulness during all the busy hours of the day. Overhead electric light wires would not have the same claim upon the public. Their use would be limited; they would continually disfigure the public thoroughfares merely for the service of the few; and, as a matter of fact, there is no comparison between the cost of laying underground an electric lighting wire, and the cost of executing the work necessary to electrical traction. If only that there must be a limit put to the use that our electrical friends make of space just above our heads, the Board of Trade should be supported in their decision in this respect. The next Traffic Commission will, if aviation is to be one of the future systems of locomotion, be called upon to extend their inquiry to the question of obstructive aerial wiring.

Then there is the internal wiring problem. It is ever with us. It is cheaper installation that is said to be essential. Just so. There have been several systems devised. But one after the other they have been found to have their own peculiar defects and requirements to make them secure and serviceable; and in the end there has not been found much (if any) saving upon their predecessors. But no matter what cheap form of wiring is introduced, there are other charges connected with installation from the street cable to the meter, with the provision of lamps, and with the attempt (if not successful) to compass security, which charges cause installation to be more expensive than simple gas piping and fittings. One idea of the cheaper wiring is to capture the "six-light man," which is another funny little way that the electricians have, through description, of making a man of small estate feel his littleness in relation to the electricity suppliers' existing patrons. They are always talking, too, of inferior class of installation being good enough for these people, and six poor illuminating lamps being as many as they want in their houses. If the patronage of these people is wanted, it is not the proper way to go to work to try to make them feel small, to treat them as inferior beings, and to apportion to them less illumination than to other classes of people. There is another aspect of the question, and that is as to how far—no matter the cheapness of the wiring portion of the installation—these six-light consumers would be a paying part of the business with the class of lamps proposed for them. Sometimes their consumption would not be enough for the meter to make note of; and, taking the average income from such installations—pooling the whole lot good, bad, and indifferent—there is very little chance of any remunerative branch of the business here. What did West Ham find last year in connection with the slot meter business that the Electricity Department tried to establish in artizans' dwellings and other small class houses? The cost of collection, repairs, and capital charges amounted in the financial year to £251, and the revenue to £362—leaving only £111 with which to pay generating and works' costs, distribution, and the other expenses associated with the supply up to the meter. It is not known whether the figures include loss on capital expenditure through removals and empties. From the figures, however, the probable success of the six-light man can be gauged. To lighten the capital charges for this class of consumer, surface wiring has been proposed; and the houses of such consumers are the worst possible in which unprotected wiring should be fixed. The fire insurance people were not enamoured of the notion, and responsible electrical engineers protested against wiring that has earned a bad reputation, and lends itself to indifferent work.

Eureka! The electrical papers are with one accord announcing fresh promising wiring systems somewhat similar in style; and they do so after the manner that the daily populars would announce the discovery of a rich new gold-field. So far is it believed that the right thing has come at last, that one contemporary refers to it as "A Solution of the Wiring Problem," and solemnly declares that there is little doubt the Stannos and Kuhlos systems of wiring, more particularly the former, will give "a very distinct impulse to electric lighting." Kuhlos wires are made, according to the description, by wrapping plain or tinned brass or copper sheet round ordinary rubber insulated conductors; and this wiring is supported by small clips nailed to the wall, and then bent round the wire. In the Stannos system the wires are also encased in tinned sheet copper. The copper is lapped twice round the wires; the second lapping being soldered thoroughly to the first. The details need not be stated here. The all-important point is—quite apart from reliability, safety, and sightliness—that wiring on the Stannos system can, so it is averred, be easily carried out at less than 10s. per point, including a carbon filament lamp. Nevertheless we doubt, when all costs are taken into consideration, the profitableness of the six-lamp man for lighting only. Why, too, suggest putting into the six-light man's house the low efficiency carbon filament lamp? Is this to ensure registration of the current when only one lamp is used, or a larger consumption than would be obtained from these poor people if they used the metallic filament lamp? It would not be right to rob these people of the greatest amount of illumination they can get from a given consumption of electricity, simply because electricity meters prefer big consumptions to little ones, and electricity stations do not detect profit in the small lighting consumers; nor would it be right to do them out of lamps that have the reputation among electricians of such unprecedented longevity. Let us see. Is the

average life of metallic filaments yet above 2000 hours? Their life expands in print to such an extent that it is difficult to keep pace with all the records of assumption. But say the laboratory figure is now 2000 hours. The six-light man who wants the greatest illumination for his money would be profoundly interested when he discovered it was necessary to spend a sovereign or more—perhaps a week's wages—every year in renewing these lamps. He would probably debate with himself whether it would not be cheaper to quietly move than to pay for the renewals if he had an agreement of any duration with the electricity suppliers.

MUNICIPAL RIVALRY IN BUSINESS.

Rivalry between different municipal undertakings in the same town produces strange results at times. That there should be rivalry where all are theoretically working in the common interest is remarkable, and is only to be accounted for by the fact that different committees and officials, in their anxiety to make a good showing for their own departments, are apt to lose sight of the fact that the same ratepayers will gain or lose by whatever happens. The interests of the ratepayers are, indeed, too frequently sacrificed to those of a department, especially if the undertaking which is to be bolstered-up is the municipal electricity works. There was a case in point at the last meeting of the Worcester City Council. A few years ago, at the suggestion of the Corporation Electricity Committee, electric pumping plant was installed at the water-works, and current was supplied to the Water Committee at 1⅛d. per unit. for the operation of the plant. On taking stock last year, the Committee found that they were paying for pumping by electricity something like four times the cost at which it could be done by steam. The actual amount paid to the Electricity Committee was £922; while, according to the estimate of the City Surveyor, the work could be performed by steam for £205. With the prospect of making such a saving, the Water Committee, being prudent men, discontinued the use of the electric plant. Their economical intention, however, left the interests of the Elecricity Committee out of account. What was to become of their business if it lost so large and profitable a customer? A quite pathetic appeal, tempered by some unkind reflections upon the City Surveyor for interfering in the matter, was made to the City Council to compel the Water Committee to use the electric pumps, whatever the cost might be. It was said that water power used for running part of the electricity plant was actually wasted; and that, instead of the £200 which is being spent on coal for steam-raising at the water-works being a real economy, it is absolute waste. The argument did not appeal so forcibly to members of the Water Committee as perhaps it ought to have done. What they were most concerned with was the getting of the pumping done cheaply; and the Chairman bluntly said that they were not going to let the Electricity Committee dictate to them as to how it should be done, or what they should pay for it. The cost of pumping by steam power is, it seems, ½d. per 1000 gallons, against 2⅜d. which it cost to do it by electricity at 1⅛d. per unit. A suggestion that the Water Committee might consider the idea of reverting to electric pumping if the current were supplied at ¼d. a unit horrified the members of the Electricity Committee, who wanted to know what other users of electricity for power would say in face of such a demand from a municipal department. As the members of the Council were apparently not prepared to answer this question, or to decide which Committee should bear the burden of the electricity undertaking, they decided to refer the whole matter to a Special Committee, who, it is understood, will try to look at it from a purely business point of view.

"Transactions" of the Society of Engineers.—We have received the "Transactions" of this Society for the year 1908. The volume contains the Inaugural Address of the President, Mr. Joseph W. Wilson, who filled the position for the second time, the papers submitted during the session, with the discussions thereon, accounts of the vacation visits, notices of deceased members, the annual report and balance-sheet, and a list of the winners of the Society's premiums. The papers are fully illustrated. A useful feature of these volumes is the general index, which extends from 1857 to the close of last year. The volume has been produced under the editorship of the Secretary, Mr. A. S. E. Ackermann, B.Sc. (Engineering).

Gas-Engine Plant at Frodingham.—The current Engineering Supplement to "The Times" contains some particulars of the first installation in this country of Klein gas-engines for blowing furnaces. This engine is a double-acting two-cycle one of the Körting type; and 68 of them, none of less than 500 H.P., have been installed in other countries. The plant which has been started at Frodingham consists of four single-cylinder double-acting engines, each of 1050 H.P.; and it is stated that they are giving every satisfaction in service both in regard to economy and reliability. Tests show that their efficiency ranges from 75 to 77 per cent.; while one of the engines is stated to have run continuously for six weeks. The capacity of the plant is about 21,000 cubic feet of air per minute compressed up to 13 lbs. pressure. A Klein engine of 2000 H.P. has been designed for an iron-works abroad.

COALITE PLANT AT PLYMOUTH GAS-WORKS.

[From Our Own Correspondent.]

As the first coalite plant erected in the country in connection with a gas-works, the installation which the British Coalite Company have made at Plymouth is naturally an object of interest; and the members of the Cornish Gas Managers' Association, who were offered an opportunity of seeing it in operation on Thursday last, mustered in strong force for the occasion. Professor Vivian B. Lewes placed his services at the disposal of the visitors, and explained the process and what is claimed for it. Mr. Charles H. Parker, son of the inventor of coalite, under whose superintendence the plant has been erected, also acted as a guide. It was not the fault of either of these gentlemen if the visiting party went away without seeing all there was to be seen and hearing a good deal about the advantages (as entertained by those interested in the system) of low-temperature carbonization. The members of the Association present included: Mr. S. J. Ingram, of Truro; Mr. H. E. Riley, of St. Austell; Mr. W. Nicholls, of Penzance; Mr. F. Portass, of Newquay; Mr. R. Greenaway, of Bodmin; and Mr. H. H. Hoare, of Falmouth, who acts as Hon. Secretary of the Association. Mr. W. P. Tervet, the Engineer and Manager of the Devonport Gas-Works, Mr. Gardiner, the Chairman, and Mr. Walker, the Manager, of the Worthing Gas Company, and Mr. P. S. Hoyte, the Engineer and Manager of the Plymouth Gas Company, were also of the party.

General Features.

One of the things which most impressed those who saw the plant for the first time was its small size and its compactness. Attention was drawn to the fact that it occupies far less space and bulks less hugely than an installation of 72 inclined retorts which stands close by, and is carbonizing rather less weight of coal per day. It is a striking comparison in its way; but it has obvious limitations, and is not applicable at any point beyond that of the weight of coal handled. Still, the coalite plant is unquestionably neat and compact. It consists of three batteries of stills (or retorts), two of which are in operation, while the third, which is intended as a stand-by, is approaching completion, and could probably be started in a week if necessary. An area of about 100 feet by 70 feet contains it all. Each of the batteries is 52 feet long by 13 feet wide. The height from the ground to the top is 16 feet; while a space of 15 feet between the units provides ample room for operating the valves and for other working purposes. At one end of the batteries are arranged the producers for making the producer gas with which the settings are heated; while at the other end are the conveyors for taking away the coalite as it is discharged from the stills. These stills are the central and cardinal feature of the whole process.

Departures from the Original.

As has been explained in the "Journal," there has been considerable departure from the original plan for the manufacture of coalite. Difficulty seems to have been experienced with the original plant in producing fuel of consistent quality. In carbonizing coal in large masses at low temperature the tendency seems to have been to produce an article which was either coke or coal, but was not coalite. With the apparatus now in use, carbonization is carried to the exact point desired, and there is neither coke on the outside nor coal in the centre of the small charges which are now dealt with.

Description of the Plant.

Each still consists of twelve tubes, cast together—32 of them set vertically constituting the battery. The tubes have a diameter of 4½ inches at the top and slightly expand to 5¼ inches at the bottom; and the length is 9 feet. In the arrangement of the setting the supplies of producer gas and secondary air are so controlled as to maintain a constant temperature of about 800° Fahr. For working purposes, two of the stills are treated as one. The travelling hopper by which the coal is supplied is divided at the bottom so as to discharge its contents into two mouthpieces; while one handwheel on the outside of the battery opens simultaneously the discharging valves of the pair of stills. A novel feature of the setting is the arrangement of the hydraulic main. There are 16 dip-pipes, each of which is fitted with a cock, to be closed during the time occupied in charging. On the end of the foul main of each of the settings is a governor. From the foul main the gas passes to one of Messrs. Cutler and Sons' condensers. Two of Messrs. Holmes and Co.'s improved Pelouze and Audouin tar-extractors have been put up for removing the tar from the gas; and there is a meter—of Messrs. Willey and Co.'s make—with a capacity of a million cubic feet per day, for registering the quantity of gas made. The purifying and storage of the gas are undertaken by the Gas Company, to whose mains it passes after leaving the meter. The plant also includes a Bryan Donkin exhauster, tar-pumps, tanks for separating the tar and liquor, and wells for their storage.

Electrically Driven Elevating and Conveying Plant.

The Coalite Company have also put down a couple of Bache engines and dynamos for generating current to drive the conveyors, elevators, exhauster, and blowers. The engines, which were supplied by Messrs. Davey, Paxman, and Co., are of 75 H.P.; and one is sufficient for the work required—the other being kept

as a stand-by. The elevator and conveyor plant is on a rather large scale for so small a plant. This arises partly from the fact that the quantity of coal handled is large in comparison with the gas produced, and partly from the necessity of adapting the new plant to its surroundings. The coal is in the first place raised by an elevator to a hopper which runs the whole length of the three batteries, and has a capacity of 100 tons. From this store the travelling hoppers, which contain the measured quantity of 12 cwt. for the dual charge, receive their supplies. On leaving the still, the coalite drops on to conveyors (in connection with which there is provision for quenching it), and is carried to an elevator that raises it to the screens and hoppers ready for bagging. As sent out, the coalite is in clean, sizeable pieces. The breeze comes in useful for the producers.

Labour Required—Charging Simple—In Discharging a Tendency to Stick.

In working practice, the operation of charging the stills seemed simple enough, though there appeared to be more men about than the size of the setting warranted. Three men are needed for the work of each setting—one being occupied in attending to the discharging valves and other operations on the ground floor, while two open the mouthpieces, shut-off the dip-pipe, bring the hopper into position, fill the stills, and screw the mouthpiece down again. Men are also required to attend to the producers; and though it was said that three are sufficient for the working of each battery, more than this number appeared to be employed. The cost of the labour, as compared with other gas-making processes, would be worth considering. Possibly allowance should be made in the case of Plymouth for the fact that the plant has been only a short time in operation, and everyone is comparatively new to it. The discharging and charging operations are as nearly as possible automatic. With some classes of coal, it was stated, the coalite falls of itself immediately the valve at the bottom of the retort is opened; leaving the still ready for another charge. What the visitors actually saw on Thursday last was that the material had a tendency to stick to the tubes; so that bars had to be used to loosen the mass round the mouthpiece and cause it to drop.

Working Results and the Fuel Account.

The charge consists of 6 cwt. of coal per still, or 12 cwt. for each pair; and the time occupied in distillation is from 3½ to 4 hours. The products of distillation per ton of coal are roughly 5000 cubic feet of gas of from 18 to 20 candle power, 13 cwt. to 14 cwt. of coalite, 22 gallons of tar, and about 15 lbs. of sulphate of ammonia. Special value is claimed for the tar; and the Coalite Company are credited with the intention to become their own tar distillers. At present the tar is sold, and the sulphate is treated in the Gas Company's plant on the works. In the process great importance is attached to the maintenance of a uniform temperature. This, it is claimed, is easily arrived at by using producer gas and the arrangement of the setting; the brickwork being so constructed that the stills are not in direct contact with the heating gases.

One of the great economies pointed out for carbonization at low temperatures is the small quantity of fuel which is required. This plant is said to need for the producers only 5 or 6 per cent. of the weight of fuel carbonized, as against 23 per cent. for horizontal retorts in ordinary gas-making practice, 18 per cent. for inclined retorts, and 16 per cent. for vertical retorts. Professor Lewes accounts for this by saying that it is in carbonization as in the speed of a ship. Up to a certain point, you may drive your ship with a very modest consumption of coal; but immediately you get beyond this moderate speed, every knot which is added costs more in proportion to the others. Carbonization at high temperature for the extraction of every particle of gas the coal is capable of yielding is, he submits, in respect of fuel correspondingly expensive.

Contention as to the Proof of Claim.

Professor Lewes contends that this installation has demonstrated the truth of the claims which have been made for coalite. It is certainly interesting as a practical working of what had previously been conducted only in a more or less experimental fashion and without reference to the gas question. So far, the demand for coalite in the Plymouth district is said to have kept pace with the supply. The carbonizing capacity of each of the two batteries in operation is nominally 56 tons of coal per day, producing 35 tons of coalite and 280,000 cubic feet of gas. Rather better results than this are understood to have been achieved. The contract with the Gas Company is to provide a minimum of 500,000 cubic feet of gas daily. This is being done; and at the same time the Company are making and selling 75 tons of coalite daily.

Tarring Metal Pipes.—Two plans are in use for coating metallic pipes with a protecting surface of tar. In the one case the pipe is first heated and plunged into cold tar; and in the other the pipe, without preliminary heating, is slowly lowered into the hot tar. Under the former plan, the metal has been dilated by heat and contracts in the tar bath. On being withdrawn, the air bubbles can readily be brushed away; but the adhesion is not perfect. In the latter case, the metal slowly expands, and the tar adheres much more firmly. Moreover, if the pipes are heated before being tarred, there is a risk that they may become fissured. The fissures being filled with tar would not be visible after the removal from the bath.

TESTINGS FOR CALORIFIC POWER.

[Communicated.]

The calorific power standard proposed by the London County Council and accepted by the Gaslight and Coke Company appears likely to awaken the interest which so noteworthy an innovation entirely merits. The writer, in his article on "Testings for Calorific Power" in the "Journal" for April 13, puts forward a view which you state in your "Editorial" on the subject does not meet with general acceptance; and it is to this point that some attention may be usefully given.

The main point in the article was to the effect that the new standard of 125 calories (net) is too high. That this view is the right one is borne out by the fact that the Gaslight and Coke Company themselves and their own experienced advisers "objected to the standard fixed—viz., 125 calories per cubic foot—on the ground that such a value could not be obtained with any degree of certainty from 14-candle gas;" and, further, "they only accepted it on the understanding that it was not to be expected of them that the standard would be regularly maintained." This entirely endorses the views of the writer on this point. In the "Editorial" you state that you do not suppose it would be possible to propose any standard value that would please everybody concerned.

The writer would point out that, while agreeing with the Company concerned on this all-important matter, he went further, and expressed the opinion that a standard which, by their own showing, was too high should not have been accepted, entirely for the reason that their action would probably be taken as a precedent for other companies. There is, however, one matter in connection with the calorific power standard which would cause the most vigorous dissentient of the standard to modify his expressions of discontent; and that is the nature of the standard imposed. Does the higher figure of 125 calories or the lower one of 112½ denote what is at present represented in the illuminating power standard by 14 or 16, as the case may be? If the higher figure, it will be as though a company were constantly supplying a quality of gas lower than their standard of 14 or 16 candles, but yet not so low as to reach 13½ or 15½ candles—the penalty limits that are now proposed.

This would be rightly considered the reverse of satisfactory with our present illuminating power standard. Will this consideration not apply to the new calorific power standard? If not, and if the fact that two or three tests a week are below 125 calories (net) will not be looked upon with disfavour by the London County Council, the position is at once modified and rendered easier of compliance, though not altogether satisfactorily, as a well-conducted gas company rightly takes a pride in allowing a fair margin above any fixed standard of quality. The penalty limit of 112½ is entirely satisfactory, and so, too, is the additional provision of a further limit of 6 calories below the figure of 112½. In fact, these wholly reasonable limits seem out of keeping with the stringent standard of 125 calories (net)—the standard proper. A standard of 120 calories and a penalty limit even slightly higher than that fixed—say, 115 calories—would have been at least complied with for weeks on end without any great trouble, which is more than can be said for the accepted standard of 125.

Those who maintain that a standard of 125 calories is a fair one must agree to one of two alternatives—either that the 14-candle mixed gas now supplied to the Metropolis is deficient in calorific power, or that it should be permissible to constantly—say, two or three times a week—supply a gas below the fixed standard of quality. Your "Editorial" and the Gaslight and Coke Company's own statements suggest the latter procedure as being justifiable. According to Mr. Broadberry, of the Tottenham and Edmonton Gas Company, who supply 14-candle mixed gas, this is found to vary between 123·7 and 126·2 calories (net), and doubtless between wider limits on occasions. These figures would appear to tally fairly closely with those of the Commercial Gas Company, though rather lower than the average of the latter's test. Mr. Broadberry, who has had experience of a calorific power standard, and who apparently welcomes the new test, evidently does not consider that the standard of 125 is one to be regularly maintained, if his own figures interpret him rightly.

As regards repairs to the Boys calorimeter, it would appear from the statement alluded to in your "Editorial" that the sole justification for disparaging the apparatus was the frequency with which it had been undergoing repairs during the current year. This fact was mentioned rather to illustrate the writer's own experience of the apparatus, and the experience of others, than to impute unreliability to the instrument on that score alone. It is true, however, that an instrument such as a calorimeter may be faulty for a considerable time before the fact, and the nature of the fault, is discovered. It may be that the writer's experience of the apparatus has been a particularly unfortunate one; and he trusts that this is so.

In conclusion, the writer would repeat that if the standard of 125 calories is merely one to be maintained as an average, and is not fixed with the same intention as the illuminating power standards have been in the past (to be exceeded on all but exceptional occasions), then there would assuredly be but little cause for apprehension.

PERSONAL.

Mr. WILLIAM CASH, who, as announced in the "JOURNAL" a fortnight ago, has resigned the secretaryship of the Bournemouth Gas and Water Company, has been appointed a Director, in place of the late Mr. S. L. Rymer.

The Directors of the Windsor Royal Gaslight Company have accepted, with regret, the resignation of their Chairman, Mr. J. L. HOLLIS. Mr. W. B. HOLDERNESS has been unanimously elected to fill the vacancy; and in the same manner Mr. F. B. BUCKLAND has been appointed Vice-Chairman.

Mr. JAMES MILLER, of Blackburn, who has recently returned from Ceará, Brazil, where he held the position of Works Manager of the Gas Company, has been selected for the management of the Dolgelley Gas-Works—a position which was advertised in the "JOURNAL" for the 6th inst. Mr. Miller was Manager at Ceará for eleven years, and formerly held the position of Manager of the Thurso Gas-Works.

After 35 years' service with the South Suburban Gas Company, Mr. R. WYLLIE, one of the Workmen-Directors, has retired. He has been a member of the Board with Mr. W. G. Waller, as a representative of the employees, for some three years. In a contested election for the vacant place of honour, Mr. GEORGE ROSS, who is the foreman in the mechanical and fittings department of the works, has been elected by the employees by a good majority. A report of the proceedings at a presentation to Mr. Wyllie appears on p. 171.

At St. Mary's Church, Newport, Essex, last Wednesday, the marriage was solemnized of Mr. NORMAN SIMPSON COX, son of Mr. John H. Cox, the Manager and Secretary of the Sunderland Gas Company, with Miss MARGARET HEATON WATERHOUSE, younger daughter of Mr. W. Waterhouse, M.A., J.P., of Newport. Among the bridegroom's numerous presents were cheques from Mr. and Mrs. Charles Hawksley and the Directors of the Sunderland Gas Company, a presentation tea-tray from the Company's officials and foremen, and a silver tea service from Mr., Mrs., and Miss Jolliffe, of Ipswich. Those of the bride included a pearl necklace from the officials and foremen of the Sunderland Gas Company.

There were upwards of fifty applicants for the appointment of Assistant Works Manager for Australia advertised in the "JOURNAL" for the 9th ult.; and the position, which is with the North Shore (Sydney) Gas Company, has been obtained by Mr. EDGAR FOSTER, at present an assistant to Mr. J. Ferguson Bell at Derby. Mr. Foster, who is thirty years of age, was formerly a student at the Sheffield Technical Institute, and was afterwards apprenticed to Messrs. Newton, Chambers, and Co., Limited, of the Thorncliffe Iron-Works, where he obtained practical experience in the workshops and drawing office. On the completion of his term, he remained with them in the capacity of draughtsman; leaving, after eight years' service, to go to Derby. During the time (four years and a half) he has been with Mr. Bell, all the drawings for the extensive alterations which have lately been carried out at the Derby Gas-Works have passed through his hands. We congratulate him on his appointment, and wish him success in his new sphere at the Antipodes.

OBITUARY.

In the notice calling the meeting of the Imperial Continental Gas Association, for May 4, the proprietors are informed of the death, on the 27th ult., of Mr. M. S. PILCHER, who was for many years one of the Auditors.

The death occurred recently at Tamworth, at the age of 76, of Mr. WILLIAM ARNOLD, who was well known throughout the Midlands as a land surveyor and valuer, and was one of the oldest Magistrates of the borough. He was at one time Chairman of the Tamworth Gas Company.

Intimation is just to hand of the death, some weeks since, of Mr. MATTHEW MILDRED, of Bankside, S.E., who succeeded to the business formerly carried on by the late Mr. Alfred Williams, and was prominently connected with this gentleman in his office of Hon. Secretary and Treasurer of the Society of Engineers—a position he held up to the time of his death in 1894. Mr. Mildred was elected a member of the Gas Institute in 1873.

A copy of the "Cincinnati Post" for the 26th ult., which came to hand a few days ago, records an instance of consideration of an old employee, to which it may not be out of place to briefly refer. About fifty-eight years ago, the concern which has developed into the Stacey Manufacturing Company was started in Cincinnati to undertake the supply and erection of gas plant. Two years later, an Englishman named John Taylor entered their service as a mechanic. He saw the firm grow from one employing only twenty men till it reached its present dimensions. He seems to have been a thoroughly conscientious workman, his rule of conduct having been to do what he would have expected of his employer if their places had been changed; and until he reached the age of 74 he wielded the sledge with the best of men. After fifty-six years of work, his faithful service was rewarded by a pension.

PARENT GAS COMPANIES IN THE UNITED STATES.

[COMMUNICATED.]

ANY comparative study of the conditions of gas supply in the United States and in Great Britain, at once reveals in the former country a continually increasing number of "parent" companies, each operating from two to thirty separate gas-works, while in the latter, as far as the writer is aware, there may be large stock holdings by the same individual in several companies, but there is no corporate control of groups of companies. Why this should be so is not apparent; but, presumably, the reason is to be found in British laws, rather than in temperament, as Ireland furnishes an example of several small works under common ownership—probably English capital, which, as every "JOURNAL" reader knows, controls through many parent corporations (some of considerable size) numerous groups of gas-works on the Continent. Yet in spite of this fact, British gas-works, as said before, stand singly.

In the United States, parent companies date approximately from the year 1880, about which time the United Gas Improvement Company was organized. In attempting to sell carburetted water-gas apparatus, it became possessed of gas properties, until gradually its chief interests lay in selling gas. Its capital stock, on which it earns about 12 per cent., and pays 8 per cent., is $45,000,000; and this will be increased to $50,000,000 in May. In addition, the value of its properties, represented by the bonds and stocks of the individual companies, far exceeds its own capitalization. It supplies gas (and in some instances electricity as well) to over 5 million people. It is the largest of our parent companies, of which there are more than twenty of varying capitalization—the smallest about the size of the Irish company. In general, these parent companies have been formed by a combination between a banking (or bond) house and a gas engineer or manager. The latter persuades the bankers that a certain gas-works is capable of earning more money than under present management. A company is formed which buys, or leases at a fixed dividend, the existing concern. The purchase price is usually recouped to the buyers by the sale of bonds, while any stock issued will be of value only if the prediction as to increased earnings are fulfilled. If this first experiment succeeds (and there have been few failures), another company is bought; and in this way a group is formed. As year by year various available companies are bought up, it generally happens now that geographical considerations can have little weight in the composition of any group, which, though of only a few companies, may represent properties separated by 2000 miles. This, of course, adds to the expense and difficulties of common management, and must be borne in mind when considering later on the attitude of the parent companies towards Gas Association meetings.

Much has been, and still could be, written on the subject of company promotion and capitalization on the basis of expected earnings, instead of investment. This matter is beyond the author's present scope; but it should be stated that, as far as the gas consumer is concerned, the advent of a parent company has usually resulted in a cheaper price and a more efficient service. Also, as yet the "innocent investor" in gas securities has received a proper return for his money. "As yet," for in some instances there will probably be a scaling-down of securities when over-capitalization has been great, and investigation following State Commission control discloses a wide discrepancy between investment and securities issued.

Why does the advent of a parent company usually result in cheaper gas and more efficient service? For the same reason, undoubtedly, that lowers wage-cost of output with each increase in the wages of skilled mechanics. In the employ of the parent company will be found men who are brighter and more energetic than those holding similar positions in the purely local companies. Then, to still further improve their employees, the parent companies have learned to utilize competition and association. The benefits of competition with his fellows is denied the average gas manager in America; for no working results are published, and it is almost impossible to know what economies are being attained by other men whose conditions are largely similar to one's own. The manager working for a parent company is told at least once a year, if not oftener, how his results compare with those obtained by his associates; and he sees promotion follow success, and dismissal due to failure. Pride and ambition are thus strongly enlisted in the struggle to excel; and each year new records are made.

Association—the meeting with other men engaged in the same lines of work, and the chance thus afforded of exchanging in formal meeting or informal chat, views and information on all points of mutual interest—is, of course, theoretically open to any man with membership in one or more Associations. The general rule, however, holds in this country that the smaller gas companies, when locally owned, are rather averse to paying the Association due and meeting the expenses of their employees. As America is a land of magnificent distances, and attendance at the American Gas Institute involves a journey of 1000 miles each way for many of the members, it is easily seen that if the company will not pay the bill, the trip is out of the question for just those men who, isolated as they are each in his own town, would be much benefited by contact with their fellows. The formation of State Gas Associations has been of great good in this

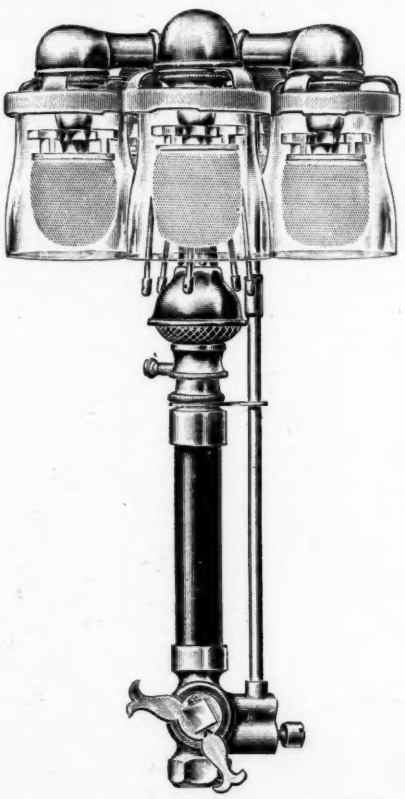
respect; as to these latter Associations, the men just mentioned are more generally able to go.

The parent companies believe so strongly in the value of association that besides paying the dues and meeting expenses of their responsible employees for at least one, and in some cases three Associations—viz., American Gas Institute, National Commercial Gas Association, and the local State Association—they also bring their employees to the home office once a year, and devote from two to six days in discussing every feature of the business from manufacturing, through distribution and accounting, to new business. In the benefit to be derived from the meeting room, there is no doubt that these parent company meetings are greatly superior to those of the ordinary Gas Association. Discussion is far more free and general; and the presiding officer does not have to call for speakers.

These meetings do much to produce an *esprit du corps;* and those in attendance can hardly fail to return to work with renewed enthusiasm. Along with the work, some form of entertainment is usually provided. This may vary from a theatre party, or a steamboat excursion, to the elaborate programme of the United Gas Improvement Company, which, after a meeting lasting for six days, sends a party of 200 men 60 miles to Atlantic City for a two-day outing—chartering a special train and monopolizing a big hotel. The horror of some local directors (not to mention municipal boards) at the thought of such expense as applied to their hard-working superintendent or secretary, may quite easily be imagined. But, as has been said before, the parent companies are achieving success; and while, of course, there are among us many broad-gauged local companies with talented and progressive employees, yet more and more the employees of the parent companies seem to be coming to the front in both individual and association work. It would be hard for us at the present time to think of the gas business in the States as existing without parent companies.

AN UPRIGHT INVERTED CLUSTER.

THE accompanying illustration shows a new upright inverted cluster burner which has been recently introduced by Messrs. J. & W. B. Smith, of Farringdon Road, E.C. It will be seen that the burner embodies a special fitting, which carries glass cylinders; and the light is thereby intensified. It is also provided with a special flash bye-pass to each light, and a gas-regulator, ensuring



J. & W. B. Smith's New Upright Inverted Cluster Burner.

the correct mixing of air and gas and perfect combustion. The cluster can be supplied any height, and in two, three, four, five, or six light; and it is substantially made. The firm have supplied several of these clusters to gas companies for converting large street-lanterns of the ordinary upright incandescent type into inverteds; and they have given great satisfaction. The fitting should prove a very useful one for this purpose.

COMPANIES AND RATING.*

USEFUL law books have reached us dealing respectively with the subjects of companies and rating, both matters which largely enter into the conduct of gas, water, and other undertakings, and in which it is important that those engaged in the control of such concerns should endeavour to keep themselves well informed. Nowadays, there must be few who are not at some time or other brought into contact with the statutory enactments relating to limited liability companies, and in connection with which they desire to ascertain their responsibilities and duties, or who may not have to consider the position of their industrial affairs in regard to the important and burdensome matters of assessment and rating. Books, therefore, that impart information upon such questions are of great utility to the gas engineer and manager and others in the conduct of their companies and the guidance of their business.

On the 1st of this month, there came into operation the Companies' (Consolidation) Act, 1908. As its name implies, it is a codifying or consolidating Statute, which collects and embodies various previous enactments relating to companies. It is "an Act to consolidate the Companies Act, 1862, and the Acts amending it." It does not introduce any new law, but effects a much needed work of collection. There are 296 sections in the Act; and familiarity with these would have been much facilitated had there been in each case a reference to the old section of whatever Act which was replaced by the new consolidating Act. This drawback is remedied by such a publication as that under review, "The Companies (Consolidation) Act, 1908," by Mr. Frank Evans and Mr. Humphrey H. King, Barristers-at-Law; for Part III. of their handy compilation gives a comparative table showing what sections of the previous Acts correspond with those in the new Act. Part II.—to work backwards—of their book forms the bulk of it, and sets out, in good print, in full, the text of the Statute which now controls all company matters. Each section, where necessary, has short explanatory notes; and references to many cases are given. The Act is itself divided into ten parts, and the six schedules of it are also to be found in this small handbook.

The first thirty pages of it contain an admirable and concise survey of earlier enactments relating to company law. These pages form Part I.; and a glance at them may not be without interest. The learned authors seem to trace the modern company from the old Guild Merchant and Craft Guilds; but we are doubtful if any such ancient and honourable descent can be substantiated. However, we are not here concerned with that, and will at once pass to the Joint-Stock Companies Act of 1844, which was "An Act for the Registration, Incorporation, and Regulation of Joint-Stock Companies." This Act did not limit the liability of members, whose individual property might be attacked by a creditor of the company. In 1855 came the Limited Liability Act, which introduced the blessed word "Limited," and under which members were not liable for judgments against the company, save only failing the company's assets, and then but to the extent of their not-paid-up shares. In the following year (1856) came another Joint-Stock Companies Act, which repealed that of 1844, and originated the mysterious "seven" requisite to form a company. It also formulated the memorandum and articles of association, and contained many clauses exactly reproduced later in the Act of 1862. This latter enactment has remained the principal Act right away to the Consolidating Act of 1908. It classified companies into limited, unlimited, and guaranteed, and contained the details of their formation, registration, management, and liquidation. No power was given to reduce capital; but this was allowed by the succeeding Act of 1867, if such reduction was confirmed by order of the Court of Chancery.

Then followed the Companies Acts of 1877, 1879, and 1880, which made certain ameliorations, and gave slightly extended powers. A trio of important measures was produced in the year 1890. First, there was the Companies (Memorandum of Association) Act, which gave power to alter the objects of the company, subject to approval by the Court. Then there was the Companies (Winding-Up) Act, which enlarged the previous jurisdiction of such matters, and which created (for this purpose) "official receivers." Thirdly, there was the Directors' Liability Act, which provided that directors and others should be liable for loss due to untrue statements in a prospectus, unless they reasonably believed them, or such statements were by an engineer reasonably believed to be competent, or were contained in a public official document. This Act is reproduced in section 84 of the new 1908 Act. To continue the survey: The Companies Act, 1900, differentiated between private and public companies, imposing more stringent conditions on the latter than the former. A private company was afterwards defined by the Act of 1907 as one in which the rights to transfer shares were restricted; the members were limited to fifty; and no subscriptions were invited from the

* "The Companies (Consolidation) Act, 1908, with a General Survey of Earlier Enactments, Notes on the Act, and a Comparative Table of the Old and New Acts." By Frank Evans, of Lincoln's Inn, Barrister-at-Law, and Humphrey H. King, B.A., LL.B., of the Inner Temple, Barrister-at-Law. London: Butterworth and Co., and Shaw and Sons; 1909. [5s. net.]

"Konstam's Rating Appeals, 1904-1908. Vols. I and II. Reports of Rating Appeals heard before the London and Other Quarter Sessions, the King's Bench Division, the Court of Appeal, and the House of Lords, 1904-1908." By E. M. Konstam, of the Inner Temple, Barrister-at-Law, Joint Editor of Ryde and Konstam's Rating Appeals (1894-1904). London: Butterworth and Co., Law Publishers; 1909. [12s. 6d. net each.]

public. Finally, there was the Companies Act of 1908, which enabled companies incorporated abroad in British possessions to hold land in our country, as now provided by section 275 of the consolidating Act.

Without going into any more detail, enough has been said to show that the legal handbook under review contains interesting introductory information, and the important company codifying Act is to be found conveniently compiled in this small volume, which, together with its index, will prove of great use to those consulting it.

Of the two volumes of rating appeals, considerations of space will only allow of a brief notice. They are a continuation of the well-known series of reports associated with the name of Mr. Walter C. Ryde, the last of which appeared in 1904. Here will be found by those interested, all the reports relating to rating decisions, among which, needless to say, are some of the greatest importance to gas and water undertakings. Thus we find fifteen pages devoted to the case of the *South Metropolitan Gas Company v. Woolwich Union and Other Assessment Committees*, which occupied Mr. R. Wallace, K.C., and his colleagues for several days in February, March, and April, 1907. So, too, is given the appeal to the King's Bench Division in *Ipswich Gas Company v. Ipswich Union*, the gist of which decision is that in rating a gas company's undertaking upon a basis of the gross receipts, prepayment meters and fittings should be treated as being provided by the hypothetical tenant, and the capital representing them should be allowed for.

Of water cases, there is the *Metropolitan Water Board v. Assessment Committees of the City of London, Greenwich, and Woolwich Unions*, in which "the Court declined to calculate the rateable value of the whole undertaking at a percentage on the structural value," but first ascertained the rateable value upon a basis of gross receipts and then apportioned it among the parishes in proportion to the gross receipts earned in each parish.

There are several important railway rating decisions, such as that by the House of Lords, on Dec. 7 last, in *Great Central Railway Company v. Banbury Union;* and there is also the House of Lords' decision in *Kirby v. Hunslet Union*, on the question of considering the value of machinery on premises in arriving at their rateable value. We mention such cases as these—and there are many others—to show how important and far-reaching are the reports contained in these two volumes, which must be properly studied to be fully appreciated.

We suppose it would be the bulk which would prevent the two volumes being issued in one—though the 800 odd pages are numbered in sequence. The inconvenience of two volumes, however, is minimized by there being a duplicate index in each volume. For the same reason that this has been done, we think the list of "Cases Reported" might also have been inserted in the beginning of Vol. II. We notice, further, in some instances the decision of the higher Court does not follow immediately after that given in the lower Court. This leads to some confusion, as in the cases of *Green and Stead v. Newport Union*, and *Great Central Railway Company v. Banbury Union*. The House of Lords' report of the former is on p. 777, not on 177 as given on p. xiii. These are, however, but mere points of convenience and detail in volumes involving a great deal of learning and of labour.

A SURVEY OF MODERN ORGANIC CHEMISTRY.*

The work before us forms a useful addition to the popular "Contemporary Science" series of text-books; and as a survey of the scope and methods of modern organic chemistry, for the use of those who have had no general training therein, it should prove very acceptable. It is in no sense a book of reference to chemical products, but (on the other hand) an attempt has been made to show the place occupied in the general scheme of classification of organic compounds by the more important technical substances which the organic chemist has utilized or has been instrumental in producing. The book will not be of much value to even the elementary student of organic chemistry; but it discloses in an attractive manner, for the benefit of others, something of the field of his studies.

Gas men who have not had occasion or opportunity to become students of this branch of chemistry may find a few hours pleasant "scientific recreation" in Dr. Keane's book. They will gain in the fourth chapter—dealing with the "Aliphatic Hydrocarbons"—some light on the nature of the hydrocarbons present in coal gas and petroleum, and on acetylene. But we doubt whether they will get any information thereby of direct service to them in their daily avocations. The fifth chapter, which refers to the "Cyclic Hydrocarbons," naturally has a good deal about benzene and other constituents of coal tar; and in the eighth chapter, on "Derivatives of the Hydrocarbons," many compounds derived therefrom are mentioned. Cyanogen and picric acid come under brief notice in Chapter X., which deals with "Derivatives of the Hydrocarbons containing Nitrogen." The rest of the work, covering 500 pages, can scarcely be said to have any special interest to readers of the "Journal."

An advanced student of chemistry from any of our Universities should be competent to write such a survey of modern organic chemistry without falling into any misstatement of fact. It needs, however, further, a good sense of the relative significance of different items, a good command of the pen, and a good power of imparting instruction, to write such a survey as successfully as Dr. Keane has written it in the pages of the little volume now under notice.

* "Modern Organic Chemistry." By Charles Alexander Keane, D.Sc., Ph.D., F.I.C., Principal and Head of the Chemistry Department of the Sir John Cass Technical Institute. London and Felling-on-Tyne: The Walter Scott Publishing Co., Limited; 1909. [6s.]

A WATER-CIRCULATING HOT-PLATE.

The securing of an efficient supply of hot water when gas is the fuel employed for cooking purposes has been a problem to which many people have applied themselves; and, among other methods of attaining this end, attention has in more than one direction been turned to the possibility of utilizing the waste heat from the burners of the cooker hot-plate. The advantages of being able to obtain a supply of hot water in this way are so obvious that they make the idea an exceedingly attractive one. Hot water without any extra cost is a very useful consideration to be able to place before both present and prospective users of gas-cookers. One of the inventors who has given time and thought to this question of the utilization of waste heat is Mr. W. H. Pirrie, who took out patents having this object in view in 1906, 1907, and 1908. An abstract of the specification of the latest patent appears on another page of this issue. After much experiment, it is confidently believed that a thoroughly satisfactory method of carrying out the idea has been arrived at; and last week a Company—the Water Circulating Gas-Cooker, Limited—was duly registered, for which we learn sufficient capital was at once forthcoming to go to allotment. The Chairman of the Directors is Mr. C. E. Ryder Terry, of the Imperial Stove Company, Leamington, who has devoted himself whole heartedly to the perfecting of the arrangement.

Some days ago, a practical demonstration was given of the invention, which consists of the turning of the cooker hot-plate into a shallow tank, in which water circulates; and it was then shown that a supply of really hot water was obtainable when the cooking burners were lighted and turned down—that is to say, by utilizing heat which would otherwise have been entirely wasted. The hot-plate receptacle, which has an inside depth of ¾ inch, holds about three-quarters of a gallon of water. By an arrangement of stops inside, the stream of water is forced in certain directions, so that no portion is allowed to remain "dead" in any part of the tank; and the trouble of furring does not arise, as the water leaves the receptacle at less than boiling-point. The water enters at the bottom on one side, and passes out from the top at the other.

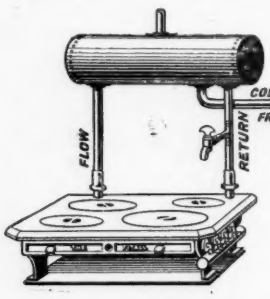


Fig. 1.—The "Fitall" Water Circulating Hot-Plate.

The hot-plate can be connected with the hot-water cistern by the ordinary flow-and-return pipes; and the boiling-burners will thus, while they are being used for cooking, keep up a continuous supply of hot water to the cistern, without any increase in the consumption of gas. To provide for the possibility of hot water being required (say) early in the morning, when cooking has not recently been in progress, the hot-plate is furnished with two special geyser burners—one consuming 7 cubic feet per hour and the other about 12 cubic feet of gas—the use of which will give a plentiful supply. In fact, it is claimed that in this way 40 cubic feet of gas, costing 1½d. with gas at 2s. 10d. per 1000 cubic feet, will give a hot bath. By keeping the small geyser burner alight during the night, the warm bath will be found ready on rising in the morning. Other claims put forward for the arrangement are that in winter the kitchen will be warmed by the hot-plate, which acts like a steam-radiator, and that plates and dishes can easily be kept warm by it. The hot-plate is closed, in a similar manner to the ordinary kitchener, and when the cooking vessels are placed in the circular apertures over the flames, the gas cannot pass uselessly away round the sides. It is stated that, notwithstanding the large quantity of water heated, there is no loss of heat to the cooking vessels, and that frequent trials by gas companies have proved that a kettle will boil on the new hot-plate in exactly the same time as on an ordinary gas-cooker, and with the same consumption of gas.

Fig. 2.—Hot-Plate with Covers Removed.

An important point about this water-circulating hot-plate—which has been named the "Fitall"—is that it can be easily fitted

to practically any make of gas-cooker; thus converting the ordinary open grid top into a closed range. This is a matter which (if the invention proves to work as satisfactorily in prolonged use as it is said to have done during careful trials) will appeal to those gas authorities who may have on hand a stock of cookers the ovens of which are all right, but the burners perhaps not quite of the latest pattern. If by merely fitting to them the water-circulating hot-plate they enable their consumers to discard the coal-range both in winter and summer, they will indeed be "killing two birds with one stone." As to the working of the arrangement in actual every-day practice, we are not, of course, personally able to speak; but it is certainly worthy of the careful consideration of all who are interested in the increase of the use of gas for cooking purposes. If it should turn out that the invention has now been brought to such a state of perfection as those who are connected with it confidently believe to be the case, there seems good reason to hope that they will not lack the reward of which they will be deserving for their efforts to solve what has been admittedly a difficult problem. It may be added that one of the London Gas Companies, after having made exhaustive tests, have ordered several of the hot-plates for their show-rooms, with a view of placing them on their district.

GAS OFFICE METHOD.

By W. B. Mimmack, F.C.I.S., of St. Mary Cray.

The details and figures with which a gas undertaking has to deal require to be kept in such form that any information or combination of figures that may be called for can be readily obtained. This need is apt to lead to complication of work and records, and the employment of unnecessary clerks; and even with them, in times of pressure, some of the work more remote from the immediate cash returns gets behind. The loss of a clerk, a further glut of work, or some similar occurrence, and the arrears get omitted, continuity is broken, and thereafter estimating takes the place of actual returns.

Every department should be subject to regular and constant check, not by a junior clerk, but by a responsible officer. This is impossible to a busy man, unless a very expeditious and certain method is adopted. Card systems are legion; and actual experience with many does not warrant their introduction. The following methods, however, have these advantages: (1) Saving of time, and therefore of clerks. (2) A regular check, absolute and expeditious. (3) Any information that may be called for is obtainable immediately. (4) Superior oversight ensures great efficiency. (5) Ordinary 5-inch by 3-inch cards can be worked for the whole system. (6) Cheapness.

Ordinary Meters.

For ordinary meters, use green cards stacked end-up in rental-ledger order, in plain boxes or drawers whose ends are a little higher than the cards, and whose sides are half the height of the ends. The cards do not require to be kept in place by any metallic contrivance. On the upper half of one side should be recorded the name, address, and number of the cooker and meter; while on the lower half special information is noted by the inspectors from time to time. On the other side, three columns should be ruled, for the date, reading, and consumption. They will last for four years, and can be called for and handled singly. The cards should be punched for placing in the binders, which are in two varieties, and hold nearly enough cards for a man's day's readings, if the cards are of good, thin quality.

The inspector takes out two binders, so carrying more than the day's work, which is always an advantage. When at the close of the day he returns the results of his day's inspection, two more books are made up for him; and the rental clerks start work at once on the cards brought in. They can divide them in the most convenient way, and the cards can be passed from one to another continuously; but if one clerk is using a bound book, he monopolizes the whole of its contents. Dead matter is eliminated; and no spaces are left for new consumers, new roads, &c. Should a question arise in the correspondence department, it is not necessary to stop the rental clerks and fetch away a bookful of entries; a card only is withdrawn, and work does not stop.

When the inspector's rounds are complete, there remain a lot of indices unread. He takes the books—or at best a specially prepared list—on the old plan; but now the actual cards only are bound up and in what order he likes, which makes an economical, straightforward job. Demand notes are thus delivered in a very short time; and the collector can get to work much sooner. The inspector will fill up from observation all the meter and cooker details, &c., and be checked against the history books and agreements; the whole being easily kept accurate and up to date.

White cards are used for forms of application for gas, salmon cards for agreements for hire of cooker, and blue ones for fires. All are stacked together in trays, broadway-up, and held in position with folding bars; and they form permanent records. On one side of the form of application is the name and address and date of application; while the other side will read as follows:—

I hereby request the above Company to supply me with gas at the premises described on the other side hereof (subject to the Company's Acts of Parliament, and to their terms and conditions, of which I hereby acknowledge to have received a copy, which I will retain for future reference), and to fix a meter for — lights; the register of the meter to be taken, accounts furnished, and payments made as the Company direct.

Signature and address where recently supplied with gas in own name and by ordinary meter, or name of bankers.

Failing this a deposit must be sent, on which interest at the rate of — per cent. per annum will be allowed.

This set of cards are arranged (like the rental cards) in districts, streets, &c., by the use of tab cards, and in rental order. The salmon and blue cards will have the number, description, and date of fixing cooker on one side, and will read as follows on the other:—

I ——— of ——— do hereby agree to take on hire from the ——— Gas Company a cooking-stove (or fire) [for details see other side], at a rental of —— per annum, payable quarterly (fractional parts of quarters to be charged as full quarters), and to pay for any damage, apart from fair wear and tear, that may be done to the stove while in my possession; and I agree to rent the stove for a period of not less than one year from date hereof. And I further agree to return the stove to the Company in a good and sound condition at the expiration of this agreement. Signed and dated.

Slot-Meters.

In the matter of slot-meters, there is no uniformity of method. Some plans are costly and absurdly accurate; while others are costly at any price, because so inaccurate that nobody knows what the results really are. Collection costs some companies 2½d. per 1000 cubic feet; and it can be done for ¾d. What can be more costly and more unnecessary than having the meters set fast, dividing up the contents of the money-box, and after calculating what is due to the company giving a receipt for the amount and handing the surplus to the consumer, and obtaining a receipt for it? Time and stationery are both wasted; and no wonder the collector is found running about with money in his pocket belonging to Mrs. Smith, who left her house empty and the front door open when the money was collected. Perhaps he gets over it by signing the receipt himself, at the risk of gaol; and all in the sacred name of prevention of fraud.

Prime cost the installation on a pink card, both sides. Detail the fittings used and the cost price in the middle columns, leaving the outside columns for the number of articles or quantities; and carry out and total. Head the card with the name and address, meter and cooker numbers, and fitters' and service layers' names. No time will be charged on the card, as that will go through the time books. Buff cards are used for application forms; one side being reserved for the applicant's use, and the other for the landlord's consent.

Stack the pink and buff cards together in district order of streets, &c., and in the same order as the collection cards. A card is thus easily found when one wants to know the cost of any particular installation, or what gas-fittings are in the house. The half-year's cards should be kept together until the close, then totalled, and there will be shown the cost of all material used in new slot installations. The cards can afterwards be distributed in the trays.

Collection of Pence.

For collecting, have buff cards similar on the one side to the blue meter-reading card, but ruled on the other side for date, reading, consumption, and cash. Bind up these as for index-reading, but at the back have a blue card ruled double on each side (and otherwise plain) for consumption and money. Every collection will be entered on a buff card, and then on the blue. The blue will be totalled and tally with the money in the bag; and the consumption will be totalled and compared with the money. If the meters are looked after and the make of meters is good (see Mr. Alfred Colson's paper read before the Institution of Gas Engineers in 1904), the consumption can be kept tallying with the cash all the time.

These cards can be run through daily in a few minutes by a responsible officer, and the whole service kept in perfect order. One should pay the cash into the bank by the blue cards, get them initialled by the cashier, stack them in order of date, and they will agree with the pass-book; and there will be a rapid reference right from the pass-book through all the collections to the original outlay. There are no books attached to this scheme; it being conducted in the most efficient manner entirely without book-keeping.

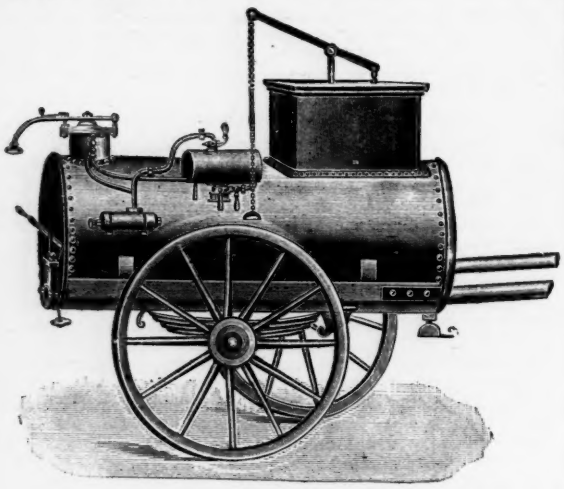
There should be a separate column kept in the cash-book for blue card payments. This should be totalled at the end of the half year, and when reduced to gas, the figures could be relied upon absolutely. The only risk, of course, is that a card may be lost. When the buff cards are first written up, they should be all numbered consecutively, which would secure them. There are additions which have to be made; and when this is necessary, put in a temporary red card, double numbered, first with the number of the buff card (after which it goes when sorted into its district), and then with its own consecutive number—*i.e.*, all red cards will be separately numbered 1 to ....., and form a second set. When all are written up again in two or three years' time, the red cards will disappear.

At any time it is possible to tell from the last consecutive number how many new slots have been put in since a certain date. No figures require extracting; they are there, and can be calculated mentally.

It may, in conclusion, be remarked that burner maintenance can be similarly dealt with.

WEGNER'S PATENT ASPIRATOR.

We have received from Mr. Bernard F. Browne, the Engineer of the Primitiva Gas and Electric Light Company, Limited, of Buenos Ayres, the accompanying illustration and particulars of Wegner's patent aspirator, which he employs for emptying syphons and similar work. He says it is also adapted for drawing spent lime from ammonia plants and for similar semi-fluids, though they may contain both brick or other rubbish. Mr. Browne thinks the utility of the aspirator for application in both gas and water works will be appreciated; and we thank him for enabling us to bring it under the notice of our readers.



The aspirator consists of a container (the one shown in the illustration is of 500 litres, or 110 gallons, capacity), above which is a large saddle or vacuum chamber, with air-tight hinged lid in complete communication with the container. On one side of the latter there is fixed externally a 3-litre ($5\frac{1}{4}$-pint) tank, with a glass graduated measure; and to this is attached a small force-pump. The vacuum in the container is obtained by exploding a small charge of the liquid in the 3-litre tank. This liquid is called by the patentee by the name of "Vaculine." It is a light petroleum distillate; but for lack of this Mr. Browne has employed pentane. To make an operation, it is necessary to pump into the container about $\frac{1}{4}$ litre (0·44 pint) of the spirit, and wait half-a-minute for it to diffuse in the air of the container. This done, the smaller hinged circular cover on the small saddle at the back of the machine is lifted, and a lighted match dropped in, when the cover is immediately replaced and locked. The resultant internal explosion immediately lifts and again closes instantaneously the large hinged lid on the vacuum chamber, having expanded the air in the container to about ten times its original volume, and allowed the excess to escape. Thus only about one-tenth of the original air remains in the container and the chamber above it. This cools down so rapidly that there is an immediate vacuum in the machine of three-quarters of an atmosphere—say, 23 inches of mercury. This is equivalent to a suction of 7 metres, or 23 feet. If it be desired to draw the full contents of the container, this may be done in less than half-a-minute. This vacuum will, however, last for hours, and may be used gradually, as, for instance, in the emptying of syphons, where the cart is drawn through the streets or about a works, when thirty or more syphons may be emptied with one explosion, according to the extent of their contents. These machines are made in all sizes up to 2000 litres (440 gallons).

Mr. Browne states that by the use of a flexible pipe and of suitable cocks, the vacuum thus obtained may be communicated separately to any number of stationary or fixed containers. The machine can also be arranged to draw from any reasonable distance by means of special flexible hose manufactured by the patentee.

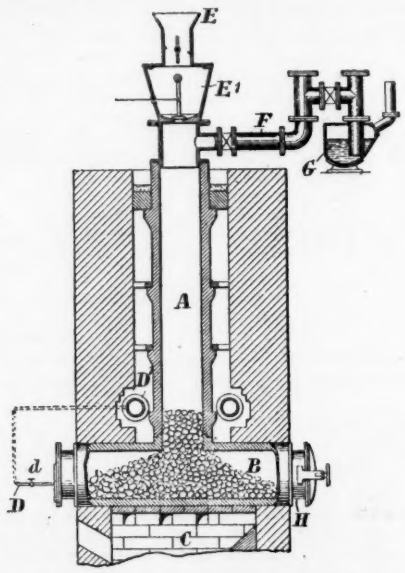
Waverley Association of Gas Managers.—The Hon. Secretary of the Association (Mr. W. Young, of Penicuik) intimates that the ninety-third meeting will be held in the rooms of Messrs. Ferguson and Forrester, Limited, 129, Princes Street, Edinburgh, next Friday. In the business is included a presentation to Mr. A. Bell, sen., of Dalkeith.

Joint Meeting of Yorkshire and Manchester Junior Gas Associations.—The fifth annual joint meeting of these Associations will be held at Rochdale on Saturday, the 1st prox. They will be received at the Town Hall by members of the Gas Committee of the Corporation and the Gas Engineer, Mr. T. Banbury Ball, and the party will proceed to the gas-works, which will be inspected under Mr. Ball's supervision, and of which each member will be presented with a printed description. After the inspection, the party will partake of tea in the Town Hall.

AN AMERICAN GAS-MAKING PROCESS.

A French patent has been taken out by the International Gas Development Company of the United States, for an improved process of gas manufacture, by which, the operation of the plant being continuous, it is claimed a great saving in the cost of production is effected. The process consists in first of all making water gas by passing steam, preferably superheated, through a layer of coke heated by some external source. The gas then rises through a vertical retort, also heated from the outside. Pulverized coal is dropped into the retort, so that a rich gas is given off by it in falling, and while it is in intimate contact with the ascending water gas. This rich gas and certain hydrocarbons emanating from the tarry vapours carburet both the water gas and the poor gas produced by the continuation of the distillation process. While falling, the coal undergoes partial transformation into coke, drops on to the bed of hot coke on the bottom of the retort, and continues to produce gas until it is completely deprived of its gaseous properties, after which it can be removed. The mixture of coal gas and water gas is continuously drawn off and subjected to the ordinary process of purification; but no fixation by superheating is required. If necessary, the gas can be enriched by the addition of oil or oil gas.

The accompanying illustration shows, in section, apparatus suitable for carrying out the process.



A is a vertical retort opening into a horizontal retort B situated at its base. These two retorts are heated by the furnace C, which may be of any type, and burn any suitable fuel. A steam-nozzle D terminates in the horizontal retort, and is provided with a valve *d*. The steam can be superheated by conveying it through the opening D^1 into the furnace. The vertical retort is surmounted by the double hopper EE^1, separated by the partition shown. The lower hopper has a workable valve to regulate the run of pulverized coal into the retort. The upper hopper is emptied occasionally into the lower one, in order to maintain a constant supply of coal. The gases are drawn off by the pipe F, and pass to the hydraulic main G. The coke produced is removed at H.

The working of the apparatus is as follows: The horizontal retort and the lower part of the vertical one can be filled with coke and brought to the requisite temperature by external heat; or, instead of employing an initial charge of coke, coal can be utilized, either pulverized from the hopper or a separate charge. When coal is used, it must be partially or totally distilled before commencing the manufacture of water gas. In both cases, however, as soon as there is a hot layer of coke, the superheated steam is admitted into the horizontal retort, and pulverized coal into the vertical one. This coal first throws off its rich gases (C_2H_4) and the tarry vapours, and then, as distillation progresses, its poor gases (CH_4) for some time after falling on to the layer of coke, and finally becomes an incandescent mass. The superheated steam is driven through this mass, and is decomposed, forming water gas, which, mixed with the poor gases from the coal—all at a high temperature—ascends in the vertical retort in close contact with the falling coal, the decomposition of which it assists, and at the same time combines with the light-giving matter contained in the tarry vapours disengaged in distillation. The quantity of carbon extracted from the coke will depend upon the amount of steam admitted into the retort. For example, no endeavour will be made to extract more than 20 per cent. of its carbon, and in some cases not more than 5 per cent., as coke is a valuable bye-product. The process is continuous; and when once the apparatus has been started and regulated, it requires but little attention.

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,, (Third Order)	50	,, ,, (Repeat Order No. 1.)	84
Cologne	240	,, ,, (Repeat Order No. 2.)	84
Dortmund	100	,, ,, (Repeat Order No. 3.)	84
Duisburg	50	Berlin—Weissensee	58
Solingen	30	Berlin—Tegel	10
Ludwigshafen	30	Chemnitz	60
Zürich	100	Worms	30
Düsseldorf	70	Charlottenburg	70
Offenbach	80	City of Berlin—Danzigerstrasse	240
,, (Repeat Order)	40	City of Berlin—Schmargendorf	80
Brandenburg	60	Rio de Janeiro	140
Trieste	20	Sunderland	60
Elberfeld	120	Brussels—Forest	120
Frankfort—Bockenheim	120	Warsaw	120
Genoa	60	Munich—Gladbach	50
Magdeburg	80	Bremen	160
Hamburg—Grasbrook	50	Aix-la-Chapelle	200
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During a discussion of the President's Paper at the Informal Meeting of Gas Managers, held at Glasgow on the 7th inst., see pp. 93 & 94,

Mr. YUILL, Dundee, stated, with regard to Retort-House Governors that he was thankful he had introduced them. He had Four 12-inch Governors fixed, and had no trouble with them; the fluctuation in the Hydraulic Main being not more that $\frac{1}{10}$th during the Twenty-Four hours.

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THE STRAINS ON TANGENTIALLY GUIDED TELESCOPIC GASHOLDERS.

The "Journal für Gasbeleuchtung" recently contained a communication by Herr J. Schmidt, of Dortmund, on the "Determination of the Normal Strain on a Telescopic Gasholder Bell Guided in Independent Framing by Means of Tangential Rollers"—it being assumed that the structure does not depart from the circular shape. It is impossible to reproduce in full the calculations of the author; but the following abstract will serve to show the scope of the paper and the conclusions to which it leads. The author observes at the outset that it is remarkable that this question has never yet been raised, although it affords an explanation of the behaviour of the bell and the encompassing framing of the holder in strong wind. He proceeds as follows.

It will be seen that the normal pressures in these circumstances deviate very considerably from the force of the wind acting on the bell, as soon as the condition is laid down that the resistances in the guide-framing must be proportional to $\sin \phi$ (fig. 1). Proof is afforded thereby that these resistances must follow quite a different law in regard to the very flexible cup-rings of the bell and the portions of the guide-framing on which they are working. It appears that it is most correct to take up the normal pressures, which according to a certain law, are caused by the wind, directly by tangential or mixed guide-rollers. That law differs according as the coefficient of reduction is assumed to be 0·57 or 0·67; and it need only be observed that, with the same total force of the wind, the latter coefficient leads to a somewhat lighter framing. Uncertainties would arise according to which of such framings was adopted for the whole of the calculation; but they would not be greater than when the resistance was taken, according to the former method, to be proportional to $\sin \phi$. Niemann's calculation leads to the same result. The latter assumption is not permissible only when the bell has a trussed crown, because in that case the crown, being, in effect, a rigid disc, ensures equally great deflection of the upper points of the framing.

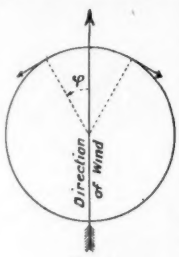


Fig. 1.

With a view to simplifying the otherwise somewhat involved investigation, it will be convenient to regard the whole guide-framing as replaced by a sheet metal envelope encompassing the bell and directly taking up the force of the wind. There is thus obtained, instead of the framing with a finite number of angles, one with an infinite number. So far as the deformation of the entire structure is concerned, the results thus obtained will not in any case deviate appreciably from the truth, as the whole investigation refers primarily to holders of moderate or very large size, which therefore would have a tolerably large number of angles. The whole investigation in this way passes over to a determination of the deformation to which a sheet-metal cylinder firmly held at its base is subjected under certain normal pressures. Further, the calculation may be made by assuming as known the normal strain which is to be investigated, and thus, through the deformation of the closed cylinder, proof is obtained that, under this strain, all horizontal sections of the cylinder remain circular, and, consequently, all deflecting moments in this direction disappear. This is obviously the simplest way. The lateral strains occurring in the cylinder provoke longitudinal strains in it; but they are of no effect on the deformation of the separate horizontal sections. As the examination must refer only to changes of shape of the horizontal sections, the longitudinal strains in the cylinder do not come into account.

The modern guide-framing of a gasholder owes its stability chiefly to the properly calculated inclined ties or diagonals. These cause the columns at the angles of the framing to act as masts, which take up the vertical components of the inclined ties in virtue of their great resistance to fracture. Such a framing is therefore composed mainly of separate frameworks placed tangentially to the bell, which would possess very small stability in a radial direction, because of their height, if they were separated from one another by the columns at the angles being detached. On this account it has been customary to resolve the roller pressures into tangential forces in the direction of the adjacent planes of the framework. If, now, such a framing must remain circular in all its horizontal sections, the horizontal resistance of any panel of the framing which opposes the forces moving the bell is a tangential force proportional to $\sin \phi$. This force can be deduced in a simple manner from the equally great deflection of the single panel in the direction of the wind. This argument applies for a framing with any number of angles—*i.e.*, for the sheet-metal cylinder with an infinite number. It is, of course, assumed that the sheet metal of the cylinder is of small thickness compared with the diameter of the cylinder. As it was premised that the horizontal sections remain circular, it follows that the resistance of the elements of the periphery may be calculated as a tangential force in a horizontal direction proportional to $\sin \phi$ without regard to the normal strain on the cylinder (see fig. 2). This resistance is a linear function of the length of the cylinder. It is equal to zero at the free end, and is greatest at the firmly-fixed base of the cylinder. Its increase is therefore constant for the length of the cylinder 1; and as this increase influences the distortion of the element of the cylinder by the length 1 only, it may be assumed that the differential of this resistance is $t = c \times 1 \times (R d\phi) \sin \phi = c\, R \sin \phi\, d\phi$, in which R represents the radius of the sheet-metal cylinder in centimetres, and c is a constant which has yet to be determined.

Fig 2.

On considering the element of the cylinder starting with the length 1, and assuming the normal pressure on the element of the area $1 \times R d\phi = R d\phi$ to be $n = A (R d\phi) (1 - \cos \phi) = AR \times (1 - \cos \phi)\, d\phi$ in which A signifies a constant indicating the intensity of the strain. Taking AR as the radius r of an imaginary circle, the graphic solution of $\frac{n}{d\phi}$ shown in fig. 3 is obtained. This n is with $\phi =$ 0 equal to *nil*, and with $\phi = \pi$ attains its highest value $2\,AR d\phi = 2\, r d\phi$ and becomes constant between 0 and π. On resolving each pressure element n into two components parallel and at right angles to the direction of the arrow, the first component is found to be equal to $n \cos \phi$, and the sum of these forces for the whole circumference to be equal to $AR\pi$. On resolving similarly each element t of the resistance into two components parallel and at right angles to the direction of the arrow, the sum of the first components for the whole circumference is equal to $R\, c\, \pi$. Since the force and resistance are equal—*i.e.*, $A\, R\, \pi = R\, c\, \pi$. ∴ $c = A$ and generally $t = A\, R \sin \phi\, d\phi$ and $n = A\, R\, (1 - \cos \phi)\, d\phi$. As the subsequent investigation does not depend on the value of A, A R may be assumed in the sequel to be equal to 1, or $A = \frac{1}{R}$. Then simply $t = \sin \phi\, d\phi$ and $n = (1 - \cos \phi)\, d\phi$. Following this procedure, the distortion of the element of the cylinder in question, having the length 1 and the radius R, may be determined. Let this element be cut in the direction of the arrow A B, and imagine the left half firmly fixed at A, and the end B free to move under the unknown horizontal force H, and subject to an unknown deflecting moment M (fig. 4). The latter must be such that the horizontal deflection and the angular distortion at the spot B of the completed ring are equal to *nil*. Then the equations will be as follows:—

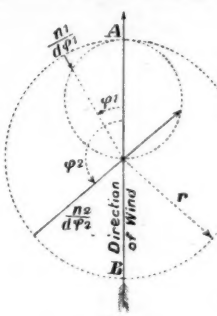


Fig. 3.

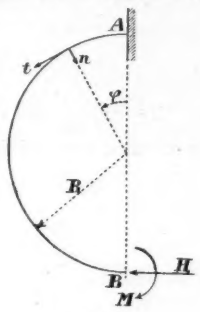


Fig. 4.

I. The Horizontal Deflection or Displacement of the Point B.

(*a*) *By the Forces n.*

The horizontal displacement of the point B by the force n is

$$d\xi_1 = \frac{n R^3}{EJ} (0{\cdot}5\, \phi \sin \phi + 1 - \cos \phi)$$

and thence, taking all the forces n, by integration, it will be found that

$$\xi_1 = \frac{17}{8} \pi \frac{R^3}{EJ}$$

in which expression E is the modulus of elasticity of the material of which the cylinder is composed, and $J = \frac{1 \times \delta^3}{12}$ is the moment of inertia of the longitudinal section of the cylinder having the thickness δ.

(*b*) *By the Forces t.*

In the first place, t is resolved into its components $v = t \sin \phi$ and

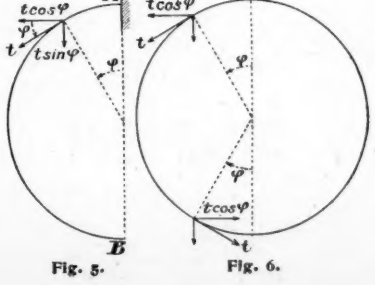


Fig. 5.

Fig. 6.

$h = t \cos \phi$ (fig. 5), and then the differential of the horizontal displacement of the point B by the forces v and h is equal to

$$d\,\xi_2 = \frac{v\,R^3}{EJ}(0{\cdot}5 \sin^2\phi - 1 + \cos\phi + \phi \sin\phi) -$$

$$\frac{h\,R^3}{EJ}(0{\cdot}5\,\phi - 0{\cdot}25 \sin^2\phi + \sin\phi - \phi\cos\phi)$$

whence it may be shown that

$$\xi_2 = \frac{7}{8}\pi\,\frac{R^3}{EJ}$$

(c) By the Forces n and t Jointly.

The total displacement by the forces n and t together is therefore

$$\xi_1 + \xi_2 = \frac{17+7}{8}\pi\,\frac{R^3}{EJ} = 3\pi\,\frac{R^3}{EJ}$$

(d) By the Force H.

Signifying this displacement by ξ_3, then similarly it will be found that

$$\xi_3 = -\frac{HR^3}{EJ}\left\{\frac{\pi}{2}(1 + 2\cos^2\pi) - \frac{3}{4}\sin 2\pi\right\} =$$

$$-\frac{HR^3}{EJ} \times \frac{3}{2}\pi = -1{\cdot}5\,\pi\,\frac{HR^3}{EJ}$$

(e) By the Moment M.

Indicating this displacement by ξ_4, then

$$\xi_4 = -\frac{MR^2}{EJ}(\sin\pi - \pi\cos\pi) = -\pi\,\frac{MR^2}{EJ}$$

In order now that the total displacement of the point B may be equal to o

$$\xi_1 + \xi_2 + \xi_3 + \xi_4 = 0$$

or

$$3\pi\,\frac{R^3}{EJ} = 1{\cdot}5\,\pi\,\frac{HR^3}{EJ} + \pi\,\frac{MR^2}{EJ}$$

whence we obtain equation (1)—viz.

$$3\,R = 1{\cdot}5\,H\,R + M.$$

Let us pass on to the angular distortions of the end point B, which is regarded as free to move.

2.—The Angular Distortions of the Point B.

(a) By the Forces n.

Indicating the angular distortions by ω, the differential of the angular distortion of the moveable end B by a single force n is

$$d\,\omega_1 = \frac{nR^2}{EJ}(1 - \cos\phi) = \frac{R^2}{EJ}(1 - \cos\phi)^2\,d\,\phi$$

whence it follows that

$$\omega_1 = 1{\cdot}5\,\pi\,\frac{R^2}{EJ}$$

(b) By the Forces t.

$$d\,\omega_2 = \frac{vR^2}{EJ}(\phi\sin\phi + \cos\phi - 1) - \frac{hR^2}{EJ}(\sin\phi - \phi\cos\phi)$$

and putting in the values of v and h, and solving, it is found that

$$\omega_2 = 0{\cdot}5\,\pi\,\frac{R^2}{EJ}$$

(c) By the Force H.

$$\omega_3 = -\frac{HR^2}{EJ}(\sin\pi - \pi\cos\pi) = -\pi\,\frac{HR^2}{EJ}$$

(d) By the Moment M.

$$\omega_4 = -\pi\,\frac{MR}{EJ}$$

As the sum of all the distortions is equal to *nil*, it follows that

$$\omega_1 + \omega_2 + \omega_3 + \omega_4 = 0$$

and therefore

$$1{\cdot}5\,\pi\,\frac{R^2}{EJ} + 0{\cdot}5\,\pi\,\frac{R^2}{EJ} = \pi\,\frac{HR^2}{EJ} + \pi\,\frac{MR}{EJ}$$

whence we obtain equation (2)—viz.

$$2\,R = H\,R + M.$$

On subtracting equation (2) from equation (1), we find that $R = 0{\cdot}5\,HR$. Consequently, $H = 2$. Inserting this value in equation (2), it becomes $2\,R = 2\,R + M$ and, consequently, $M = 0$. Hence the deflecting moment at B is equal to *nil*.

The sum of all the horizontal components of the individual forces n may now be determined. It may first be observed that

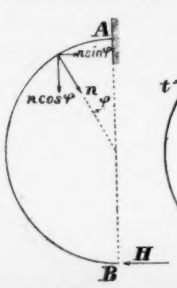


Fig. 7.

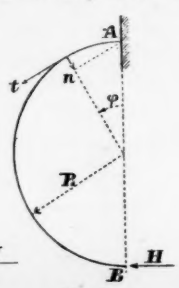


Fig. 8.

the sum of all the horizontal components of the individual forces t is equal to *nil*, as $t \cos\phi$ always occurs of the same dimensions twice acting in opposite directions (see fig. 6). The first sum for the half-circumference (fig. 7) will be found to be equal to + 2, or equal to H. Hence the longitudinal pressure at the point A, at which the cylinder element is cut is equal to *nil*.

The deflecting moment M_o resulting at the apex A (fig. 8) is calculated from the arc terminating at A, and is found to be

$$M_o = 4\,R - 4\,R = 0.$$

Thus at the point A the moment is likewise equal to *nil*. We may thus also suppose that the cylinder is cut at A without the supervention there of a longitudinal force and a moment, and without disturbing the state of equilibrium thereby. Then the deflecting moment for any position C on the arc (fig. 9) is found by calculation to be

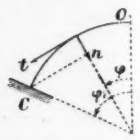


Fig. 9.

$$M_c = \cos o + \cos\phi_1 - 0{\cdot}5\cos\phi_1 - \cos\phi_1 - \cos o + 0{\cdot}5\cos(-\phi_1)$$
$$= -0{\cdot}5\cos\phi_1 + 0{\cdot}5\cos\phi_1 = 0.$$

Thus the desired proof is obtained that the deflecting moment is in general equal to *nil—i.e.*, with the assumed normal strain on the cylinder proportional to the function $1 - \cos\phi$ the cylinder remains perfectly circular. Fig. 10 shows the whole amount of

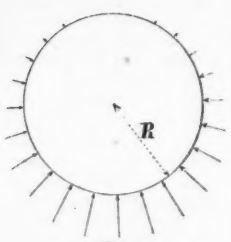


Fig. 10.

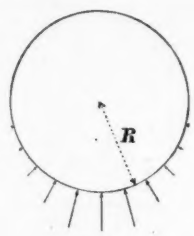


Fig. 11.

this normal strain for R assumed to be of any size. Fig. 11, on the other hand, shows the strain on the cylinder by wind on the basis of the coefficient 0·67. It will be seen how widely different these kinds of strain are from one another. In order to prevent distortion of the very elastic ring formed by the cup of the bell, it is desirable to transmit the force of the wind directly to the windward side of the holder, either by tangential rollers or by radial rollers pressing outwardly on the columns at the angles. In order, however, to utilize the guide-framing throughout its whole circumference, and to protect the rings formed by the cups against distortion at right angles to the direction of the wind, radial rollers acting on the inside are, moreover, not to be despised. The same effect was obtained by the old so-called mixed guide-framing, consisting of both tangential and radial rollers. In all cases the standards must be calculated not only to withstand fracture, but also to resist distortion tangentially and radially. The determination of the pressure of the rollers remains, as hitherto, a very untrustworthy calculation.

In bringing these considerations to a close, it may be worth while calculating also the whole force P resulting from that normal load and pressing the thin-walled cylinder in the direction of the arrows. A comparison may thus be made between it and the force of the wind. According to the foregoing calculations, the component of the force n in the direction of the arrow is equal to $n\cos\phi = AR(1 - \cos\phi)\cos\phi\,d\,\phi$. It will then be found that the sum of all these forces for the whole circumference and a cylinder of unit length is

$$P = 2\,AR\,\frac{\pi}{2} = AR\,\pi$$

But when $\phi = \pi$ the specific pressure

$$\frac{n}{R\,d\,\phi} = A\left[1 - (-1)\right] = 2\,A.$$

Indicating this maximum specific pressure by p, we have

$$P = 0{\cdot}5\,p\,R\,\pi, \text{ and for the length of cylinder L,}$$
$$P = 0{\cdot}5\,p\,R\,L\,\pi = 0{\cdot}25\,\pi\,p\,(2\,R \times L) = 0{\cdot}735\,p\,(2\,R\,L).$$

This force is thus about 17 per cent. greater than the force of the wind

$$0{\cdot}667\,p\,(2\,R\,L).$$

A simple contrivance for lowering plate girders was used recently on the Pere Marquette Railroad, for replacing a truss bridge by girders. The two girders were set up, riveted to the cross frames, the ties placed, and the completed section slung from cantilevers between two gondola cars which were filled with coal. The cantilever "rig," according to the "Railway and Engineering Review," consisted of six 8-inch by 16-inch timbers projecting beyond the end of each car, resting on blocking at the forward end and at the rear, and under a 12-inch by 12-inch crosswise timber bolted to another under the floor. A similar beam was placed across the top flanges of the girders, and bolted by long bolts to the lower flanges. Heavy 2½-inch rope was passed under this timber several times, and up over a bolster on the cantilevers. The girders were lowered by easing-off the ropes.

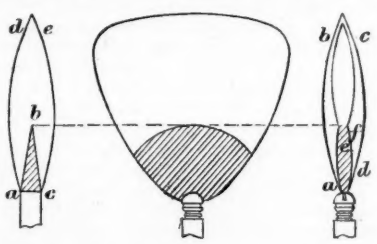
THE THEORY OF FLAME AND OF INCANDESCENT MANTLE LUMINOSITY.

The "Transactions" of the American Illuminating Engineering Society for February, which have just come to hand, contain the text of a paper by Mr. W. H. Fulweiler on the above subject, read by him at a meeting of the Philadelphia Section of the Society. Many of the matters referred to in the communication have been dealt with in our columns from time to time; but the author has brought them together, and, embodying them with the results of his own researches, has produced an interesting contribution to the proceedings of the Society. The following extracts from the paper will give an indication of the character of his work.

The paper opens with some observation on luminosity, which the author says may be properly defined as a form of radiant energy which, acting on the human eye, produces the sensation known as light. He points out that, while luminous radiations may be excited in several ways, the most useful one is the raising of a solid body to a high temperature. He then goes on to show that, according to Kirchhoff, both the total energy and the energy of every wave length emitted by a "black" body must be greater than that from any other body at a given temperature. Carbon approaches very closely a black body, and therefore is less efficient than the metals, such as platinum, tungsten, and tantalum, and probably the mixture of thorium and cerium used in making the gas-mantle; so that if carbon could be raised to the temperature at which tungsten and tantalum may be regularly worked, it would give more light than they do, but would be less efficient. The author considers that the question of high working temperature is even more important, as between carbon and the thoria-ceria mixture, in open flames, where the oxidation of the carbon puts even a lower limit on its possible working temperature, while the mantle may be worked up practically to the highest heat attainable with the flame. He closes his introductory remarks by explaining that flames may be divided into three general types—the non-luminous bunsen flame, used for all heating purposes and in the Welsbach burner, the luminous open-flame burner of the fishtail or the argand type, and the incandescent mantle. He then deals with each kind successively.

The Bunsen Flame.

The bunsen flame is formed when a mixture of gas and air burns freely in the atmosphere, and it has the structure shown in the accompanying diagram. There is a small sharply-pointed inner cone enclosed by the zone *a b c*, surrounded by the less sharply defined outer cone which is enclosed by the invisible zone *a d e c*.



In the inner cone there is the air-gas mixture burning in the zone *a b c* to carbonic oxide, carbonic acid, hydrogen, and water diluted with the atmospheric nitrogen brought in with the air. These gases, excluding the nitrogen, form the constituents of the water-gas reaction, which in a normally-burning flame comes into equilibrium at the temperature of the zone *a b c*, which is about 1550° C. The zone *a b c* consequently furnishes a continuous supply of diluted water gas to the upper cone, which, gradually increasing in temperature, burns to carbonic acid and water in contact with the atmospheric oxygen in the zone *a d e c*, in which the temperature rises (according to Féry) to from 1710° C. to 1870° C. Thus there is a mass of glowing gas surrounded by the thin zones where the actual combustions are taking place. This condition is further shown by the fact that oxygen has never been detected in analytical quantities in the upper cone.

The relative positions and colours of the two combustion zones are mutually dependent on the air-gas ratio delivered by the burner-tube. The inner cone thus represents a stationary explosion, and its attitude is dependent upon the fact that the velocity of the explosion is slightly less than that of the gases issuing from the burner-tube. Thorpe* has given some values for the velocity of explosion with different air and coal gas ratios:—

Ratio $\frac{\text{Air}}{\text{Coal Gas.}}$	Velocity in Inches per Second.	Ratio $\frac{\text{Air}}{\text{Coal Gas.}}$	Velocity in Inches per Second.
6·50	11·4	5·00	39·7
6·00	24·2	4·75	36·7
5·50	32·2	4·33	29·0
5·25	38·6	3·33	3·8

These facts are plainly shown by the long blue inner cone with a small air-gas ratio and its gradual shortening with increasing air, until finally the zone *a b c*, now a bright green in colour, becomes violently agitated, vibrates in and out of the burner-tube once or twice, then forms a detonating wave, and explodes, usually igniting the jet of gas at the base of the tube. It is now said that the burner has "struck-back" or "lighted-back." Certain factors, however, may limit or modify this action. If the top of the burner-tube be covered with wire gauze or a porcelain button containing a number of small holes, the velocity of the issuing mixture is increased, and thus a higher air-gas ratio may be used than with an open tube. Moreover, as the explosion flame approaches the gauze or button, the heat is absorbed so rapidly that the explosion velocity is diminished.

The colour of the cone, as already mentioned, varies with the air-gas ratio. According to Lewes,* with air and coal gas in the ratio of 2·3 : 1, it is blue, changing to a bright green when the ratio reaches 3·4 : 1.

The temperature gradient in the inner cone from the burner-tube to the zone *a b c* is very steep; rising from a few degrees above that of the atmosphere to upwards of 1500° C. with extreme rapidity. In the upper cone from the zone *a b c* to *a d e c* the rise is more gradual, first on account of the fact that the conduction increases approximately as the square root of the temperature, and secondly because of the larger surfaces enclosing the upper cone permitting the rising current of gas to be more quickly heated by conduction. While the zone *a d e c* has the highest temperature—from 1750° C. to 1870° C.—it is so thin, and its position is shifting so continuously, that one does not ordinarily secure the advantage of its high temperature; and it is found that for practical work the body to be heated must be buried quite deeply in the flame.

Coming to the luminous flame, by gradually decreasing the air supply from the bunsen the inner cone elongates, and the top of the zone *a b c* disappears. The upper cone first becomes tipped with yellow, and the luminosity extends downward towards the inner cone till the flame becomes entirely luminous, when the air supply is completely cut off, and the luminous zone apparently merges into the upper portion of the inner cone. As a matter of fact, it encloses the upper portion of this cone; but it is here so thin that its effect is lost. Thus there is obtained the original form of the gas-flame.

The early flames were merely small single jets, imitating the candle, and not giving much more light; but later several jets were collected at one burner. These developed into rows and circles, thereby giving the fundamentals of the argand and slit or batswing burners. About the year 1820, the increase in luminosity that was noted when two of the single jets impinged on one another led to the union-jet or fishtail burner; while about 1854 the principle of recuperation was tried with a double chimney argand burner.

A flat luminous flame appears simple enough; yet there has been an enormous amount of work done on it—much of it misdirected in vain efforts to find facts to fit pet theories. Sir Humphrey Davy in 1817 gave the first—and, in general, the accepted—explanation of the phenomenon. He held that the luminosity was due to hot particles of carbon heated by their own combustion. Tyndall suggested that the luminous particles need not be burning. These views were generally accepted until Dr. Frankland, in 1867, began hunting for some recondite reasons. He showed that non-luminous flames could be made luminous by increasing the pressure, and he decided that the luminosity was due to the dense carbon vapours in the flame, and not to particles of carbon. He showed that the factors influencing luminosity were access of oxygen to the flame, velocity of the hydrocarbon vapours, and pressure of the atmosphere.

Stein showed in 1875 that the particles held by Frankland to be hydrocarbon vapours were really pure carbon with some occluded gases. Soret, in 1874, followed by Burch, and later by Stokes (1878), examined the flame spectroscopically, and showed that it did contain particles of carbon, and had some property of reflection that increased with the richer gases of high candle power. Knapp showed that loss of luminosity might be caused by neutral gases which could not oxidize the carbon particles; while Wibel held that this result was caused by the lowering of the temperature, and that it was shown by the flame regaining its luminosity by heating. Barentin and Blochmann demonstrated that this result might have been caused by the expansion in volume in the heated tube opposing such a back-pressure to the rising column of gas that the necessary quantity of air was no longer drawn into the tube. Heumann, in 1877, mixed the diluting gas in a holder previous to heating, in order to overcome the last objections, and showed that the effect was due entirely to the cooling and diluting effect of the nitrogen of the air, while with pure oxygen the increased activity of the combustion overcame the diluting. Stein showed, however, that he could decompose coal gas with a flame rendered non-luminous with nitrogen. Landoldt and Blochmann took up the study and analysis of the gases in the flame, and the preferential theory of combustion was widely discussed.

In the early nineties, Lewes† brought out his acetylene theory. His claims were: (1) That the luminosity of hydrocarbon flames is due to the localization of the heat of formation of acetylene, which is formed in the flame in the carbon and hydrogen produced by its decomposition. (2) That such localization is produced by the rapidity of its decomposition, which varies with the temperature of the flame and with its composition. (3) That the average temperature otherwise would not be sufficient to produce the incandescence of the carbon particles in the flame. This theory

* See "Journal," Vol. XXX., p. 61.

* See "Journal," Vol. LIX., p. 795.

† *Ibid., loc. sit.*; also Vol. LXV., p. 796.

was in conflict with the work of Armstrong, Haber,* and Bone on the chemical questions relating to the formation of acetylene, and with the work of Smithells and Thwaite on the physical side relating to flame temperatures.† The work of Smithells showed that the use of ordinary thermo-couples did not give indications nearly high enough, owing to the rapid conduction of heat along their length, so that it was not certain that the temperatures would not suffice to explain the incandescence of the carbon particles. This question has been cleared to a considerable extent by the work of White and Traver‡ and Haber and Reichert, so that one can now make fairly accurate determinations of flame temperatures by using two couples of different thicknesses simultaneously. The late work of Bone and Coward, on the decomposition of the hydrocarbons by heat, seems to have given a very clear idea of the origin of the carbon particles.

Consider now the probable mechanism of an ordinary open flame. The thin sheet of undiluted gas rises from the top of the burner and immediately commences to expand. The hydrogen, owing to its great diffuse power, and to some extent the methane, rush to the outside of the rising column of gas, and are immediately burned, in contact with the atmospheric oxygen, along with a very small percentage of the general constituents of the gas in contact with this burning zone. The outer burning zone forms, as it were, an intensely hot envelope for the illuminants in the gas, which, from their high specific gravity, rise straight from the burner tip, thereby protecting them from the inrush of oxygen, and intensely heating them by conduction.

The general structure of the flame will then be as follows: Referring to the diagram, there is an inner cone, shaded as in the bunsen burner, surrounded on the sides by the zone *e f*, where the bulk of the hydrogen, some methane, and probably carbon monoxide are burning. The remainder of the gas is heated by conduction as it rises straight up between these hot walls. Measurements in this central core of gas show that its temperature increases from about 200° C. just above the tip to over 1100° C. at the edge of the luminous zone. At this temperature (or, say, 1200° C. as Smithells' measurements were probably in error to this extent) the hydrocarbons are decomposed.

Considering the various causes which tend to increase or diminish the luminosity of the flame, it is found that they may be divided roughly into two classes—those that affect the formation and quantity of the carbon, and those that determine their temperature. Under the first class the effect of diluents may be considered. In general, one may consider that diluents act in two ways—by dilution, thus decreasing the concentration of the carbon particles per unit of area, and also in small quantities in reducing their temperature in the upper cone, while in large quantities this temperature is reduced to such a point that the hydrocarbons are not decomposed—probably when below 1000°C.—and they burn directly in the outer cone to carbon dioxide and water with a non-luminous flame. That the cooling effect of diluents is an important factor was shown by Wibel and Heumann, who rendered non-luminous flames luminous by restoring to them, by preheating, the heat absorbed in heating the diluent. Moreover, separating the carbon particles chemically, using chlorine, will render a non-luminous flame luminous.

With flat-flame and argand burners, it has been found that, by increasing the width of the slit or by the use of larger holes, with proper pressure regulation, the duty, or the light evolved per cubic foot of gas burned per hour could be increased. Just what limit may be placed on this extension is not known; but as the pressure must be increased with widening the slit, the consumption of gas is increased, so that it would probably be the practical size of the resulting flame. The increased width of the slit results in a slightly thicker core of carbon particles, thereby increasing the concentration per unit of area, and slightly lengthening the time during which they may be heated, so that they may approach more nearly the temperature of the zone *a b c d* in the diagram.

The question of the proper burning pressure is another point of importance in realizing the full duty from any burner. With any given size slit, as the pressure is increased, the duty rises to a maximum when the flame is just short of smoking, then falls rapidly with a further increase of pressure. There would appear to be some relation between the velocity with which the gas leaves the tip and its power of expanding by diffusion. As the pressure is increased beyond this critical point, an injector action is set up by the sheet of gas drawing air into and mingling with it, thereby destroying the luminosity as noted above, and burning directly into carbon dioxide and water.

Considering now the factors that influence the temperature of the carbon particles in the flame, the size of the outer zone *a b c d* has already been mentioned as influencing the temperature gradient. With argand burners, it has been found that the intensity may vary widely by using different sizes of chimneys. If one could protect the carbon from the atmospheric oxygen for a longer period, and thus allow it to assume more nearly the flame temperature, or could raise the temperature of the cold (comparatively speaking) inner core of the flame, a higher average temperature of the carbon could be secured in the luminous cone. This result is attained in the regenerative burners which were first brought to a practical form by Siemens.

The average output per cubic foot per hour of 16-candle coal gas burned under the best conditions in the various types of burners, would be about as follows:—

	Candles.
Regenerative	10·00
Standard argand	3·20
Ordinary argand	2·90
Flat flame No. 7	2·44
Flat flame No. 1	0·85

Incandescent Mantles.

It has been seen that in the open-flame burners the luminous effect is limited by the inability to bring the radiating body—carbon—to the temperature of the flame. In the incandescent mantle, on the other hand, there is obtained a fixed radiating zone of constant dimensions that may be heated to any practically attainable temperature. The basic idea of using a fixed incandescent solid was probably originated by Gurney in 1826, when he heated a cylinder of lime in the oxy-hydrogen flame. Drummond, however, perfected the idea; and it now bears his name. Later, buttons of zirconium and magnesium oxide were tried for street lighting in Paris. They were heated by an oxygen and coal gas flame; but they were soon abandoned on account of their inconvenience and expense. Talbot in 1835 discovered that calcium oxide in a finely divided state became incandescent in the flame of a spirit lamp; and Gillard, about 1848, used a basket of platinum gauze to secure a useful light from his non-luminous water-gas plant. The subject seems then to have dropped till about 1875, when there was a revival of the use of metallic mantles by Palmer in 1876, Lewis in 1881, Popp in 1882, and Sellon in 1886, who made use of platinum generally as the incandescent body. In 1880, Clamond exhibited a basket mantle made of infusible oxides. In 1885, the Fahnehjelm comb, which was intended for water gas, was patented, In 1886, Welsbach brought out his first mantle. It was very fragile, and quite inefficient, as the influence of cerium was not understood until 1892, when the 99 per cent. of thorium and 1 per cent. mixture was brought out. This really put the mantle technically on a commercial basis; the other difficulties being entirely mechanical.

When a mantle is placed over a bunsen flame, owing to the fact that the mantle is colder than the flame, there is a layer of gas molecules separating the flame from the mantle. As the velocity of the gaseous mixture passing through the mantle is increased by burning larger quantities of gas in it, the insulating layer is diminished in thickness, and the mantle temperature rises. This action explains to some extent the increase in efficiency due to higher consumption of gas per unit of time. Again, with many ordinary burners, the efficiency of the injector action of the mixing-tube rises rapidly with increasing pressure and the corresponding increased volume of gas delivered, so at the high pressures at the burner tip a greater air-to-gas ratio is secured. The output of the gas rises as the air-to-gas ratio is increased (other factors being equal), until it reaches a maximum apparently, with ordinary burners, when the ratio is about 12 per cent. less than that required for the complete combustion of the gas.

In considering the relative efficiencies of various gases in the mantle, one should remember that the burner and mantle combined is a heat-light engine of rather low efficiency—about that of the ordinary slide-valve steam-engine—and that the energy delivered as light must bear some direct relation to the energy put into it as heat per unit of time; so that, as in the gas-engine, it is the heat per unit volume of combustible mixture that is the determining factor, with the assumption, of course, that the air required is properly supplied in each case.

In general, it is found that the air required for the complete combustion of a gas bears a fixed ratio to the heating value of the gas. Casaubon* found that the volume of air required for the complete combustion of 1 volume of gas multiplied by 112·9 gives the heating value of the gas in British thermal units per cubic foot. He used a cerium mantle, and noted the ratio of air to gas when the mantle changed from red to white. Therefore, for nearly all gases, the heating value per unit volume of mixture would be closely the same, and the luminosity would depend on the volume of mixture burned per unit of time or the total heat energy expended.

M. Sainte-Claire Deville made an exhaustive test on this point, and showed that, contrary to the earlier belief, the theoretical flame temperature is not important, but that for any given burner there is a particular rate of heat consumption per unit of time that yields the maximum of efficiency, while the maximum luminosity or intensity per unit of area will be secured at a rate from 50 to 60 per cent. in excess of the efficient rate. This is quite what one would be led to expect, in general, from any transformer of energy.

Considering the displacement of the zone of final or complete combustion of the bunsen flame (*a d e c*) by the influence of the mantle, it is found that as long as the temperature of the mantle is above 1400° C. the water-gas equilibrium holds at the surface of the mantle, which will therefore always be surrounded by a reducing atmosphere.

Regarding the composition of the mantle, while there are several admixtures of oxides that give efficient results for a short time, nothing as yet seems able to displace the thoria-cerium combination, if for no other reason, because of the great stability of the latter at the temperatures involved. White and Russell† have

* See "Journal," Vol. CIII., p. 319.
† *Ibid.*, Vol. LXVII., p. 74; Vol. LXV., p. 1310.
‡ *Ibid.*, Vol. LXXX., p. 562.

* See "Journal," Vol. XCV., p. 41.
† *Ibid.*, Vol. LXXIX., p. 892.

shown the effect on the specific consumption in heat units per hour required to yield 1 candle power in mantles containing varying percentages of cerium. They fell from 65 B.Th.U. in a mantle containing 0·2 per cent. of ceria to a minimum of 35 B.Th.U. at 1 per cent., rising again to 43 B.Th.U. at 1·6 per cent. These figures were obtained in 1901; and the specific consumptions have since been decreased to 20 B.Th.U. per candle for ordinary illuminating gases, while 14 B.Th.U. per candle is claimed for acetylene.

In conclusion, the author hopes he has shown that the question of luminosity in gas-flames, whether open or mantle-burner flames, is not complex; and one need not seek some recondite explanation for the phenomenon. He believes that it is purely a question of high temperature and a solid radiating body, modified by the fact that, in the case of the mantle, its radiations are strongly selective.

STEAM & AIR METERS IN WATER-GAS PLANT.

At the last Meeting of the New England Association of Gas Engineers, a paper was read by Mr. R. E. WYANT, of New Haven (Conn.), on "Some Results of the Use of Steam and Air Meters in Water-Gas Plant." The following are some extracts from the communication.

There are few processes more simple in conception than that involving the manufacture of water gas, and yet for the past twenty years no other part of the gas business has been more carefully studied. But while an elementary statement of the process is simple, the practical difficulties are many and often perplexing. The process gives rise to many variable conditions which seriously interfere with the successful operation of the plant; and consideration of the improvements which have been effected in apparatus and in methods of operation will show that the most important of them are concerned with the elimination of these variable factors. Lest, by association, we have grown accustomed to think of them as a necessary part of the water-gas plant, or, by elimination, we have forgotten them, I will recall some of those which have to be met: (1) Quality of fuel. (2) Varying quantities of moisture in the same or different fuels. (3) Temperature of the fuel bed. (4) Variations in the quantity of air supplied to the generator and the carburettor. (5) Changes in atmospheric conditions. (6) Resistance of the fuel bed to the passage of air and steam. (7) Uneven temperature in the fuel bed. (8) Variations in the quantity of steam used. (9) Depth of the active fuel bed. (10) Position of the fire zone. (11) Proportion of the down-runs. (12) Faulty cleaning of the fire and reduction of the grate area by side clinker. (13) Variations in the cycle of operations. (14) Time consumed in putting on and taking off runs. (15) Variable temperature of the carburettor and superheater. (16) Variations in the quantity, rate, and distribution of oil.

The practical problem before us is to eliminate these variable conditions to the fullest extent. Referring to the list, No. 1 can be quickly determined by analysis; and No. 2 is far more important in the case of coke than of coal, and can be readily determined by drying samples and weighing the moisture lost. For practical purposes, the moisture can be compensated for by more generator air-blast. Nos. 3, 4, 5, 6, and 9 are wholly or in part connected with the air-blast, and in so far can only be eliminated by measuring the quantity of air supplied to the generator. No. 7 may be due to the steam supply, quality of fuel, bad cleaning, or a number of things in combination for which no general remedy can be given. Nos. 3, 6, 8, 10, and 11 are dependent upon, or connected with, the steam admitted to the generator, and require some means of measuring or gauging the quantity used. Nos. 9, 12, 13, 14, 15, and 16 are specially dependent upon the faithfulness of the gas maker, in carrying out the scheme laid down. Nos. 9, 10, and 11 have so important a bearing on the whole process as to require brief mention before dealing with the subject further.

Immediately after cleaning, ash begins to form throughout the fire, but more especially near the grate-bars. To maintain a uniform depth of active fuel, the bed must be gradually raised to take the place of the ash formed. In a 12-hour run, from 18 to 24 inches of ash are usually formed, so that the height of the fire should be raised to this extent during the shift. The use of down-runs fills a double purpose—in promoting the formation of ash low down in the generator, and in depressing the zone of maximum temperature. Both actions tend to form the clinker low down in the fire. Economy of fuel results directly from the low fire zone, because the upper surface of the fire is cooled down to such a point that excess of carbon monoxide is not formed by the air-blast. The number of down-runs is therefore limited by the amount of carbon monoxide required to heat the carburettor. It is well to note, too, that fuel economy is also secured in the same way by high blasting rate.

The proportion of down-runs to be used depends largely upon the character of the fuel and local conditions. For an average grade of anthracite coal, 60 per cent. of down-runs can be used to advantage, except at the beginning and ending of the shift, when the proportion may be reduced to from 40 to 50 per cent. With a large proportion of down-runs, it must be remembered that the quantity of carbon monoxide formed at the beginning of the blow is small, and requires a small amount of carburettor blast at first, with an increase in the latter as the blow proceeds. As the regulation of the fuel-bed determines, in large part, the quantity of gas made and the generation of carbon monoxide to heat the carburettor, the importance of maintaining a proper condition of fuel-bed is apparent. Combined with the judicious use of down-runs, if we can deliver the same quantity of air at the same velocity each blow, we have eliminated a set of variables which affect capacity, quality, and economy in both fuel and oil.

From a large number of experiments, it has been found that, as a general figure for anthracite coal and 22 to 24 candle power gas, good fuel results are likely to be secured with the use of about 1400 cubic feet of air per 1000 cubic feet of gas made. Experiments thus far show that an economical rate of using this air lies between 95 and 105 cubic feet per minute per square foot of grate surface. At a lower rate, a larger quantity of air will be required, and loss of carbon monoxide at the stack-valve is likely to result. These figures refer to an active depth of fuel-bed of from 6 to 7 feet. A deeper bed will produce more carbon monoxide in the blasting gases, and but little difference in the quantity of gas made per run.

These considerations indicate briefly the value of a meter of some sort to determine the quantity of air used. Not only does the air-meter enable us to continue a uniform condition of blast once determined for a given set of conditions, but in changing from one set of known conditions to another it enables us to repeat any previous cycle perfectly. By measuring the air supplied to the generator, we are enabled to eliminate the uncertainty of the resistance of the fire, and to supply the same quantity of air per 1000 cubic feet of gas made at the end of a day's run as at the beginning, though it will probably require 7 or 8 inches more generator blast pressure to do this. We can also deliver the required quantity of air at the rate most economical in point of restoring the heat to the fuel-bed, and in furnishing only sufficient carbon monoxide to maintain the carburettor and superheater temperatures. We can also readily compensate for varying conditions of moisture in the fuel and for atmospheric changes.

Turning now to steam-meters, we observe that they provide a simple and accurate means of delivering the required quantity of steam without variation to the generator under all conditions, and of instantly changing from one rate to another. In determining upon a set of new conditions, this ability to deliver any desired quantity of steam without recalibration or adjustment is of great value. The meters also enable us to proportion readily the quantity of steam on up and down runs to secure uniform make on both runs and favourable conditions of fire. What these variations are is largely a matter of experiment, depending upon the character of fuel and the quality of gas required. Ordinarily, more steam is wanted at the base of the generator than at the top, on account of the condensation in the ash-pit, &c. As a general figure, it has been found that 34 lbs. of base steam and 27 lbs. of top steam per 1000 cubic feet of carburetted gas made are about average requirements in the case of ordinary anthracite coal and gas of 24-candle power. With these steam rates, and under the conditions heretofore noted, we should expect a make of about 56 cubic feet of gas per square foot of grate surface per minute, with a total make per run of about 280 cubic feet per square foot of grate. A concrete example will conveniently illustrate the use and operation of the meters. To this end, let us assume the use of anthracite coal and the production of 24-candle gas.

To summarize, let us assume that we are to start an 8 ft. 6 in. set under the conditions above stated. We should expect satisfactory results on the following basis:—

Inside diameter of generator	6 ft. 6 in.
Area of grate surface	33·2 sq. ft.
Depth of active fuel bed	6 feet.
Desired make per square foot of grate surface—	
Per minute of run	56 cub. ft.
Per run	280 ,,
Length of run, nominal	5·0 min.
,, ,, actual	4·8 ,,
Base steam per 1000 feet of gas made	34 lbs.
Top ,, ,, ,, ,,	27 ,,
Air to generator per 1000 feet of gas	1400 cub. ft.
Velocity of air per sq. ft. of grate per minute, say	99 ,,

Applying these figures to the 8 ft. 6 in. set, we have—

Make per minute of run = 56 × 33·2 = 1859·2 cubic feet.
,, run = 1859·2 × 4·8 = 8920 cubic feet.
Base steam = 1859 × 34 = 63·2 lbs. per minute.
Top ,, = 1859 × 27 = 50·2 ,, ,,
Air per blow = 8·92 × 1400 = 12,488 cubic feet.
,, sq. ft. of grate per blow = 12,488 ÷ 33·2 = 376·1 cubic feet.
Length of blow = 376·1 ÷ 99 = 3·8 minutes actual.
,, ,, = 4 minutes nominal.
Air per minute of blow = 12,488 ÷ 3·8 = 3286 cubic feet.

The above assumption formed the basis of a test run of five days' duration. As it proceeded, it was found desirable to change the quantity of steam and the proportion of down-runs to meet the actual conditions. The table on p. 158, showing the methods of operation on the last day of the test, has been followed quite uniformly since. The results are very nearly an average for the five days' test. The whole test was very carefully made, and on one set running continuously.

In order to compare the test results with ordinary operating

Average make per run	8980 cub. ft.
Make per set, 24 hrs., including time of two cleanings	1,226,000 ,,
Base steam, assuming same make up and down	32·07 lbs. per 1000
Top steam, assuming same make up and down	26·70 ,,
Average steam per 1000 cubic feet	28·80 ,,
Average number of down-runs, 24 hours	61 per cent.
Air per 1000 cubic feet	1365 cub. ft.
Length of run (actual 4·8 minutes)	5 min.
,, blow (,, 3·8 ,,)	4 ,,
Gross coal per 1000 cubic feet	30·50 lbs.
Oil per 1000 cubic feet	3·98 galls.
Illuminating power of gas	23·66 candles
,, ,, per gallon	5·94 ,,

conditions, I append a table showing the average results made with the same size sets, but with many broken runs, during the month of December, 1908. It will be noticed that much more oil was required, and it was necessary to shift back and forth from coal to coke during the period covered.

	Coke.		Coal.
Make per run	6470 cub. ft.	..	8844 cub. ft.
,, minute of run	1703 ,,	..	1842 ,,
,, sq. ft. of grate per minute of run	51·30 ,,	..	55·50 ,,
Base steam per minute	60·00 lbs.	..	60·00 lbs.
Top ,, ,, ,,	48·00 ,,	..	50·00 ,,
Average base steam per 1000, assuming equal make up and down	35·23 ,,	..	32·57 ,,
Average top steam per 1000, do.	28·19 ,,	..	27·14 ,,
Oil per 1000 cubic feet	4·64 galls.	..	4·49 galls.
Illuminating power of gas	5·71 cand.	..	5·74 cand.
Average fuel per 1000 cubic feet	31·93 lbs.	..	31·93 lbs.
Air per 1000 cubic feet	1407 cub. ft.	..	1396 cub. ft.

This fuel figure is the average for both coke and coal, because in shifting backwards and forwards between coke and coal there were partial runs using both kinds of fuel. For this reason I have to give you the average figure, which accounts for the same figures being reported in each case, though there is really very little difference.

The average fuel results obtained in regular operation for the three months succeeding the introduction of the steam and air meters are 31·76 lbs. of gross fuel delivered to the water-gas plant per 1000 cubic feet of gas made. This is a saving of 4·11 lbs. of fuel over the average for the three months preceding the use of the meters; the fuel in each case being anthracite coal and coke in varying proportions. In addition to the fuel saving, we have increased the make per set about 20 per cent. on both coal and coke. In considering the fuel results given, it is but fair to say that they were obtained from only two 8 ft. 6 in. sets in use at a time, and with but one set in operation about half the time.

The manufacture of water gas is a chemical process involving the use of definite quantities of all the substances employed. Many of the reactions are but little understood, and many of the constituents are so complex as to make exact and full analysis impracticable. Considering the real delicacy of the process, and the number of details involved, the wonder is that, with the hit-or-miss methods quite commonly employed, we get so good results. The use of steam and air meters is a natural development of the process, and by their employment we are on the way to more accurate information and better results. On the other hand, it does not follow that the simple introduction of these meters will, in itself, guarantee improvement. To the ordinary gas maker they are of little assistance unless he is instructed to follow a scheme laid out for him.

Heating by Incandescent Gas-Mantles.—In the last issued minutes of the French Society of Civil Engineers, M. Violle mentions an idea of M. Marcel Delage to modify the constitution of the incandescent gas-mantle so as to turn it into a heating mantle. To effect this, a mantle of asbestos fibre is soaked in a solution of silica of soda, and when dry, in nitrate of cerium, which gives it considerable calorific radiating power. The mantle is then hung on a support of magnesia above a blue-flame burner placed in a special kind of chimney. By these means, and under good conditions, quick heating is obtained, which has the advantage of being able to be easily regulated.

North of England Gas Managers' Association.—As already stated in the "JOURNAL," the half-yearly meeting of the Association will be held in the Lecture Theatre of the North of England Institute of Mining and Mechanical Engineers, Newcastle-on-Tyne, on Saturday, the 1st prox. (the President, Mr. W. Ford, in the chair), when Professor W. A. Bone, D.Sc., F.R.S., of Leeds University, will deliver a lecture on "The Influence of Surface upon Gaseous Combustion." Thereafter the members will consider a resolution that Rule 9 be altered to read as follows: "The Association shall hold general meetings on the first Saturday of May and the first Saturday of October each year (the Committee having the power to alter these dates under special circumstances), for the reading and discussion of papers, election of members and associates, and for general business; but the election of officers shall only take place at the general meeting held in May." The *agenda* also includes a recommendation of the Committee that the Associatian contribute the sum of twenty-five guineas to the Livesey Memorial Fund. There will be a luncheon at the Royal Turk's Head Hotel.

DEMONSTRATION WORK BY GAS COMPANIES.

Some Suggestions for Lady Helpers.

At the Chicago Meeting of the National Commercial Gas Association of America, a paper was submitted by Mrs. Helen Armstrong, in which she offered a number of useful suggestions to ladies occupying positions as demonstrators for gas companies. Though intended to meet conditions existing on the other side of the Atlantic, many of them are applicable in our own country. We therefore reproduce them practically in their entirety.

An attractive display of ranges and other appliances in sales-room, with someone in charge who knows how to use them, is quite desirable. Extra exhibits during discount days might show the results of these appliances—such as toast, cake and bread, broiling, and ironing. This gives an opportunity to secure names of interested persons for future reference. Cards of instruction for the use of a range should be furnished with it, and others given out on application. These should be tested with the gas of the sellers, and then revised if necessary. This should be done by a practical cook, who keeps an accurate account of the time occupied while doing the work. See that salesmen and fitters have practical instruction as to the uses of the range and the general management of the oven, the adjustment of burners, the care of the range and the economy of the oven. This will ensure uniformity of expression and correctness of argument. See that church societies, and other women's organizations, are supplied with gas-ranges, either free or at nominal cost. The benefit to be derived from this is evident. There should be a periodical inspection of all such appliances, in order to ensure efficiency and satisfaction, and a charge made when necessary. The condition of ranges as often seen in such public kitchens is deplorable.

Instal gas in schools for teaching domestic science. If this is not in the regular course, make all possible effort to introduce it. Public opinion can be moulded by influence, and the women interested in such a movement by persistent effort. The equipment for this work, with a cabinet range as well, should be furnished by the stove company.

Arrange for summer schools for cooking for housewives, utilizing public school kitchens, even when conducted in a very modest way. This will prove very effective.

Fit up a suitable space in the gas office for the convenience of women, with desk room, reading-table, &c., as in up-to-date banks, utilizing a gas-heater here to speak for itself. This room will prove useful and very popular. Co-operate with any store demonstrations in which a gas-range can be used. If the demonstrator favours a range not carried in your town, persuade her to make use of something from your own stock. Women are very apt to imagine that the make of range used is largely responsible for the excellent results shown in these exhibits.

Co-operate with hospitals, and secure the interest of nurses, who will readily appreciate the advantage of broiling and boiling facilities—a grilled chop, crisp bacon, well-made toast, nourishing soup and broth. The latter is only made possible by long, steady heat; much nutriment being lost when the temperature is not evenly maintained. Broiled bacon is one of the articles now prescribed by physicians to many convalescents; it being an appetizing form of fat readily assimilated, and vastly different from fried bacon so commonly known. In small places it may be possible to instal a temporary equipment of gas in protracted illness for the benefit of the patient and convenience of the nurse. This practically ensures its own permanency.

Encourage cooking contests with gas. The woman who takes a pride in her cake making, and wishes to enter the competition, will gladly avail herself of her neighbour's range, if needful, in order to do so. A few such experiments will convince her of the satisfaction of baking with gas. School girls also are glad to enter into such plans; and we must remember that they are all housewives in embryo.

Do not overlook any means of influencing the cooks in favour of gas, for their importance must not be under-estimated. They are apt to be "set" in their ways, and many feel that nothing can be accomplished unless a red-hot stove is in evidence. A cooking school for their benefit should be conducted during part of the summer, and a question-box for their use should be a permanent feature. It must, however, be handled by a practical cook herself, as any errors in replies would be quickly discovered. No other one will discover a housewife's ignorance so quickly as her servant.

Co-operate financially with clubs or church societies that engage a lecturer in domestic science. This will prove a very material advantage, and put the gas company in favour with these organizations. It is surprising how far a little money will sometimes go in this direction, as has been repeatedly proved in my own experience.

Women as inspectors for the gas companies prove a strong practical advertisement for gas as fuel, and New York and St. Louis afford good examples of the value of inspectors (1) to follow up the installation of ranges, (2) to respond to inquiries and calls, (3) to secure new business, and (4) to put the business manager in touch with conditions. This last point perhaps is quite as important as any. Oftentimes difficulties he might never reach can be located and remedied through this source.

The inspector must be practical, and well equipped for her

position, both by training and personality, able to listen first and then to talk. This sounds improbable, but it has been known. Her first work, perhaps, will be to instruct in the use of the gas-range in homes. She should teach the economy and efficiency of gas, the uses of various burners and how they should be adjusted, the cleanliness and comfort of gas, and the possibilities of the oven as to economy—pointing out the variety of dishes which can be cooked at one time in it, providing there is careful management, and doing away with odours which are noticeable if cooking is done on top of the range. She should explain the use of the simmering burner, as this is not usually very well understood, and teach that the oven door should be left open after roasting or any other cooking where moisture is created, to avoid rust. It is also advisable under some conditions to leave the door open a few moments after lighting. She must explain how to take care of the range and keep it in condition, and do this without offence; teach the reading of the meter by cards, which should be supplied to the customers; and, of course, understand the construction of the range, in order to explain how one burner will do as even baking as two.

Special instruction needs to be given regarding the broiling facilities of gas-stoves, as too many people utilize this space as a receptacle for flat-irons, &c. An inspector should be in the office during discount days, to answer questions about the ranges and other appliances, and exhibit results when feasible. It is best for inspectors to make calls for testing ovens by appointment; thus no time is wasted, and no housewife is surprised and disturbed in an untidy kitchen. It is important that the actual mixing of materials should be done by the cook or the housewife, or advantage would be taken of the inspector's ability in this direction. Instances have been known where women made it a point to call up the inspector when they wished an especially good cake. We cannot afford to be so philanthropic as that.

A woman of middle age will secure confidence more quickly than a young girl. A housewife resents being told how to cook by a person of youth and evident inexperience, however well trained. A stranger is preferable to a local person, first because she will be less liable to criticism; and, secondly, no time will be wasted in local gossip. She must be thoroughly interested in her work, which is, of course, a desirability in any position. She must be pleasing in manner, and not easily ruffled or quick to take offence. She must be neat. This I consider an especial necessity. A young woman who is careless in her dress, or has untidy hair, has no business in a kitchen. She must be tactful and oblivious of kitchen sights; and however able to offer an opinion, she must avoid being officious. The chief objection to this admirable combination is that, other things being equal, she will probably be married by one of the company's men in a short time. But even this might be made advantageous. Work of this kind, if well done, should be well paid. It is nerve-wearing; and for this reason the hours should not be too long. It would be done best if never overdone.

Model kitchens fitted up in gas office buildings are of untold advantage. A woman who has any interest in her home will see something here to attract her attention and make her realize her own needs. A kitchen cabinet and utensils may be secured at almost any cost from manufacturers; and this offers an excellent showing for various gas appliances. A regular hour for consultation at the office will invite the confidence of women; and they will be glad to take advantage of this opportunity to make various inquiries regarding matters pertaining to the kitchen. Gas offices can be used for lessons occasionally in the evenings. As large a building as an opera house is usually unsatisfactory, because the audience is too far removed from the speaker to invite free comment and discussion. If women are allowed to ask the questions desired, many points will be brought out which might otherwise be overlooked. Better have a smaller room well filled than a large room in which people are sparsely scattered about. It is, of course, a great mistake to confine such work to the spring and summer months. This is a point which the gas men are beginning to realize now. Gas as a hot-weather fuel has been over-emphasized.

Special sessions for nurses, with a talk on invalid diet and possible class work in hospitals, can be made valuable. On various occasions certain clubs may be invited, or the lecturer supplied to church organizations, or the Young Women's Christian Association. This is often looked upon as simply a diversion; but results may amount to more than would be imagined. On one occasion, where we co-operated with the Catholic churches, the priest himself told his parishioners that it was vital that they should attend these practical lessons. A special invitation to high-school girls often results in their showing a practical interest in cooking which they might not otherwise do. A brief special talk on economy and the care of the range would prove a help in the practical education of the public at any of these demonstrations.

Free lessons are often followed by paid ones; the salary of the teacher being paid by the company, the church conducting the work and retaining the admission money. The people really appreciate instruction in economical cooking in this day of expensive food stuffs; and the dishes should be neither elaborate nor expensive.

Women in the employ of gas companies can be of very practical assistance in planning the arrangement of kitchen furniture and appliances in new homes. They can also furnish suggestions in the remodelling of kitchens already in use. Such persons, well-qualified, and full of the enthusiasm of their work, become a power in any community. In no other way can a gas company with certainty secure and maintain the goodwill of the housewife, the real head of the home. See that your employees in this line are furnished with the proper implements for their needs, and then "Let the women do the work."

GAS-ENGINES TO GENERATE ELECTRIC POWER.

At a recent Meeting of the Institution of Electrical Engineers, a paper on "The Use of Large Gas-Engines for Generating Electric Power," the joint production of Messrs. Leonard Andrews and Reginald Porter, was presented. It gave the results of an attempt to compare gas-engines with steam-turbines for central station work.

For the purposes of their comparison, the authors endeavoured to show what would be the respective total cost of generating power by steam-turbines and by gas-driven generators under certain assumed conditions. In the scheme it was assumed that the maximum load to be dealt with was 8000 kilowatts; that the overload and stand-by capacity of the plant would be such as to carry the maximum load of 8000 kilowatts for at least two hours should any portion of the plant break down at the time when one unit was laid off for overhaul; that the power generated was utilized for public and private lighting and for tramway and general industrial motor load; that the load factor was 24 per cent.; and that the efficiency of distribution was 80 per cent. It was further assumed that the cost of good bituminous slack of a calorific value of 13,000 B.Th.U. per pound was 12s. per ton delivered at the generating station. As it was impossible to estimate the cost of obtaining a site with a plentiful water supply, the authors based their comparisons upon the assumption that cooling-towers would be used in conjunction with a public water supply.

A convenient lay-out for the steam plant, as well as a corresponding one for the gas plant, was illustrated. For the former the authors assumed that steam-turbines of the horizontal type would be used, directly coupled to three-phase generators, and that each turbine would exhaust into a separate contra-flow surface condenser placed directly below the turbines. The cooling water would be obtained from a town supply and circulated by electrically driven centrifugal pumps through natural draught cooling towers; a separate pump being used for each unit. For the gas plant the authors supposed the engines to be of the slow-speed four-cycle double-acting tandem type, directly coupled to overhanging fly-wheel three-phase generators. The cooling water for the engines would in this case also be obtained from a town supply, and circulated by means of a small pump driven from the engine crank-shafts; the water being cooled in natural draught cooling-towers.

For a maximum output of 8000 kilowatts, the authors considered that the most economical arrangement of units for the steam plant would be five sets, each having a normal capacity of 2000 kilowatts, with an overload capacity for two hours of $33\frac{1}{3}$ per cent. In the event of two sets being laid off simultaneously, the remaining three would be capable of supplying the maximum demand for two hours. The output of gas-engine units, it was stated, was limited to about 1500 B.H.P. per cylinder; this being the largest size yet made. Four such cylinders, arranged in twin tandem, would give a combined output of 6000 H.P., or (say) 4000 kilowatts. For the gas scheme, the authors did not think it advisable to use even such large units as 2000-kilowatt sets, since the overload capacity of gas-engines is only 10 or 12 per cent.; and consequently three 2000-kilowatt sets would only be able to deal with a maximum demand of 6600 to 6700 kilowatts, and six units of this capacity would therefore be required to deal with the specified maximum demand and provision for stand-by. A more economical installation, it is considered, would be seven generators, having a normal capacity of 1450 kilowatts each and an overload capacity of 1600 kilowatts. With such an installation, if two generators were laid off simultaneously, the remaining generators would be able to deal with the full maximum demand of 8000 kilowatts for two hours, as specified.

In dealing with the question of sulphate of ammonia recovery plants, the authors called attention to the following points, which they said should be taken into consideration before adopting such plants: (1) The first cost of the recovery plant, particularly for small sizes, is much greater than the first cost of non-recovery plants. (2) Considerable extra labour is involved in operating these plants. (3) The purchase of sulphuric acid, of which approximately 1 ton is required for every ton of sulphate of ammonia turned out, is a heavy item. (4) The yield of heat units per ton of coal is slightly less if sulphate of ammonia is recovered than the yield from non-recovery plants. (5) The extra cost of repairs and the cost of handling and packing the bye-product absorb some of the profits effected by the recovery process. Experience up to the present, the authors stated, appeared to indicate that it is not worth while to attempt to recover sulphate of ammonia unless the total output of the plant is greater than 2000 H.P., and then only on an exceedingly good load-factor. For a maximum output of 8000 kilowatts, the authors thought it would probably pay to put down ammonia-recovery plant, even for so poor a load-factor as 24 per cent. For the particular conditions under consideration, it was recommended to use eight producers

of which four would be equipped for the recovery of ammonia and the remaining four for non-recovery.

The total capital cost of the respective steam and gas plants for the specified maximum load of 8000 kilowatts was estimated as follows: Steam plant, £139,525, about £13 19s. per kilowatt installed; gas plant, £176,875, or about £17 13s. 6d. per kilowatt installed.

The authors then passed on to investigate at considerable length the question of the running costs for the two plants. They stated that various tests on gas-engines of outputs ranging from 500 to 5000 B.H.P. showed that the actual consumption of fuel per unit generated, exclusive of no-load losses, was approximately 1 lb. per kilowatt-hour for any output from no-load to full load. The fuel required for banking the producers, it was stated, was only a small fraction of that needed for banking boilers. The heat radiation from the producer was also small, and the producers in the estimate were guaranteed not to exceed 50 lbs. of banking fuel per hour per producer. In the case of the steam plant, as four 10,000 lb. boilers were required for each 2000-kilowatt unit, the coal for banking these boilers would, it was estimated, be at least 448 lbs. per hour per plant unit. For both the steam and the gas plant, the authors added 25 per cent. to the ascertained fuel consumption under test conditions, to cover the contingencies met with in practice, such as variations in the quality of fuel supplied and so forth.

For a maximum demand of 8000 kilowatts, a load-factor of 24 per cent., and a distribution of 80 per cent., the units generated per annum would be 21 million. From curves given in the paper, it was shown that for a 2000-kilowatt turbo alternator the steam consumption per unit generated was 15·5 lbs., or, assuming an evaporation of 8 : 1, 1·94 lbs. of coal. From the same curves it was shown that the no-load losses—viz., the amount of fuel required to run the generators at full electro-motive force on open circuit, and with all auxiliaries, including exciters, for a plant of this size—amounted to 900 lbs. per hour.

The maximum total engine hours—the hours when the engines are running light and doing no work—would be 35 per day, or (say) 12,800 hours per annum; and the banked boiler hours would be 46 per day, or (say) 16,800 per annum. The total annual coal consumption for the steam-turbines was given as 23,330 tons, or 3·55 lbs. per unit generated; the over-all thermo-dynamic efficiency being 7·4 per cent. For the gas-engine station the total no-load engine hours should be 17,450 per annum, and the banked producer hours 35,000 per annum. The total coal consumption for the gas plant was therefore 20,465 tons, or 2·18 lbs. per unit generated; the over-all thermo-dynamic efficiency being 12 per cent. It was estimated that approximately 71 per cent., or 14·58 tons, of the total coal consumption would be gasified in the ammonia producers, and would yield at least 586 tons of sulphate of ammonia, the sale of which at £11 per ton would bring in £6446 per annum; but the cost of sulphuric acid and bags for packing reduced this figure to £5524.

The total cost for generating 21 million units of electricity, including interest and depreciation at 10 per cent., was given as follows: Gas, £33,523, or 0·383d. per unit; steam, £43,668, or 0·498d. per unit. Allowing 6¼ per cent. for interest and depreciation, the total cost was: Gas, £26,900, or 0·306d. per unit; steam, £38,428, or 0·438d. per unit.

The conclusions arrived at by the authors may be briefly summarized as follows: While they believe there is an important field for the use of large gas-engines for driving electric generators, they do not consider there is at present justification for the suggestion that has been made that the internal combustion engine will in the early future be used to the exclusion of the external engine; the former being very much more economical than any external combustion engine yet known. The capital cost of a gas-engine and producer installation is greater than that of a steam-turbine and boiler installation of equivalent overload capacity. There is no material difference in the reliability or in the cost of labour, stores, and repairs of the respective systems. In cases, therefore, where the cost of fuel is low and the load-factor is low, it is generally a mistake to use gas-engines. On the other hand, where the load-factor is high or the cost of fuel high, there can be no doubt whatever that gas-engines will prove by far the cheapest prime mover for driving any form of electric generators.

A Weighty Argument.—For inventive capacity, "Meteor" of the "Electrical Times" may be strongly commended. He refers to the London Fire Brigade returns; and makes an oblique allusion to our editorial article on the subject (p. 13). Then he tries to pad-out the returns of fires occurring in connection with gas through negligence. This is the result of his efforts: "By the way, what of the 135 cases of children playing with matches? We should much like to know how many of these cases occurred in the summer months when in most houses coal-fires are not lighted at all. We believe that at least 100 of them are the result of using gas and gas-stoves, whilst the remainder are perhaps due to using coal-fires. The final conclusion to be drawn from the report is that there were about 450 ordinary fires due to the use of gas, and that 130 fires occurred where electric light was used, most of them in spite of its comparatively greater safety as ingenuously admitted by the managers of gas-works." Cannot "Meteor" put a few of the fires down to "father's bad habit of smoking?"

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

Visit to the Croydon Gas-Works.

On Saturday afternoon last a visit was paid by members of the London and Southern District Junior Gas Association to the Croydon Gas Company's works at Waddon. On arrival, they were met by Mr. J. W. Helps, the Engineer and General Manager, under whose leadership the tour of the works was subsequently made. There was much to be seen, and a great deal to be explained; but the visitors did the one thing thoroughly, while the other was equally thoroughly carried out by Mr. Helps and those of his assistants who also acted the part of guides—namely, his son Mr. Maurice Helps, Mr. F. J. Harrisson, Mr. J. A. Brentnall, and Mr. S. Ringham. The full illustrated descriptions of the different sections of the works that have appeared from time to time in the pages of the "JOURNAL," must have prepared those of the members who had studied them for a treat. But however great their expectations may have been, it is quite safe to say they were not disappointed. The Croydon Gas-Works are a model in many respects; but perhaps the point about the section most recently laid down that was chiefly commented upon by the members was its attractive appearance. There is no unnecessary ornamentation about the buildings; and they are arranged so as to allow of grass plots being placed between. The grass here flourishes exceedingly; and when to this feature is added that of scrupulous cleanliness, it becomes easy to understand the enthusiastic remarks of the visitors. This section of the works, it may be pointed out, was described in detail, and illustrated by a large number of photographs, in Vol. C. of the "JOURNAL" (pp. 623, 698).

Before making a start with the inspection, Mr. Helps gave the party a few particulars with regard to the works, indicating some of the features which he considered called most for attention. He said that the works were divided into two sections. The old section was capable of producing about 4 million cubic feet of gas per day; and instead of enlarging this, they decided to build a new section to make another 4 million cubic feet. This new section was now at work; and they hoped at an early date to complete the entire remodelling of the old section, on which work had already been commenced. The visitors would proceed first to the old section, where, however, it would not be necessary to spend much time, except in No. 2 retort-house, which was in process of reconstruction. There had just been put down 15 settings of tens; and it was intended to use West's compressed air machinery for charging and discharging. The whole of the coal breaking and elevating and coke-handling plant would be driven by electrical power. There had been put down two 120 H.P. gas-engines by the National Gas-Engine Company, and two 50 kilowatt dynamos. The coke conveying plant would be on the principle of an electric crane overhead picking up the coke in skips, and putting it into hoppers, after which it would drop on to a conveyor and then be properly screened. The new section now at work comprised one retort-house—No. 3—having 29 settings of eights, with West's compressed air machinery, and conveying plant on the De Brouwer principle which was driven by gas-engines. The coke plant took the coke to the store, to loading hoppers, or to the carburetted water-gas plant, as desired. When made, the gas was first passed into two Colman "Cyclone" tar separators. These took out all the heavy tar; and then the gas, while still on the vacuum side, was passed through a Livesey washer which contained carburetted water-gas tar—the object being to take out some of the naphthalene, but more especially to pass forward in the gas certain light oils which boiled at about the same temperature as naphthalene, so that when the gas went into the water-cooled condensers, and was brought down to about 60° Fahr., the naphthalene and light oils fell down together, and thus trouble was prevented. They had had no difficulty with naphthalene while this system had been in operation; but just lately, when they wanted to clean out the Livesey washer, and had to shut it off for a week, stoppages immediately began to take place. This showed that the system was really a useful one. Afterwards the gas was pulled through the exhausters, and went back to the condenser-house, where it passed through two more Livesey washers, and then through two Kirkham, Hulett, and Chandler "Standard" washers, from which it travelled to the purifiers. They would not, of course, expect him to explain to them all the different processes, but merely to indicate those points in which perhaps their practice at Croydon somewhat varied from that at some other gas-works.

The first party was then led off by Mr. Helps, and passed at once through the old No. 1 retort-house, which was the first one built when the works were removed to Waddon in 1866, and in which direct firing was employed. This, of course, is out of action now. The next house—No. 2—was a similar one; but, to accommodate the new conditions, it has been made 20 feet higher and 12 feet wider. The two engines and dynamos referred to by Mr. Helps will supply all the electricity required about the works. The building which contained the old sulphate plant is also under condemnation; and in its stead there will be erected lavatories, mess-rooms, &c. It was explained by Mr. Helps, when proceeding through the new section, that everything throughout was in two 2 million cubic feet units, rather than one of 4 million feet. This was a plan which had been advocated by other engineers; and he felt convinced that it was the right one. Much interest was excited by the house which contains—after the Continental

practice—the condensers and washer-scrubbers. By this means, it was explained, an equable temperature was secured; and very much better working resulted. Attention was drawn to the fact that there are no seals in this house. Everything drains to seal-pots outside; these being emptied by a simple vacuum arrangement, the idea of which Mr. Helps got from Tottenham. Among other things, the light oils with the naphthalene run down to these seal-pots. The sulphate of ammonia plant is provided with a centrifugal dryer, with the aid of which Mr. Helps produces sulphate containing no more than 1 per cent. of moisture. By means of a push-plate conveyor, the sulphate is taken overhead along the store; and it can be deposited in any spot that may be desired. Passing round the end of the new section, the visitors saw that of the last 10 acres of land purchased a good proportion is still uncovered; and on this the employees are privileged to enjoy cricket, tennis, and bowling.

A visit was paid to the carburetted water-gas house, in which are installed four sets of Humphreys and Glasgow apparatus; and in connection with this plant it was stated that an arrangement of the firm named for purifying the blast gases, which had been found to work successfully in some other places, was being installed. By this device, the gases, in passing up a series of pipes, are brought into contact with a spray of water, which carries down the "flyers"—small particles of coke and ashes, &c.; and the sludge which is the result runs away to a settling tank. Considerable interest was manifested in the Thorp and Marsh "Rotary" meter, having a capacity of about 200,000 cubic feet per hour (which is the station meter for the new section), and in the smaller similar meter which is used when the load falls below a certain figure. These meters, of course, take up a small amount of room. Indeed, the members were able to accurately measure the saving in space which is secured by installing them; for they were shown side by side a 60,000 cubic feet per hour "Rotary" meter and an 80,000 feet square station meter. The two boosting plants—De Laval turbines and Sturtevant blowers—were also minutely examined. By means of these, in winter time, for the evening consumption a pressure is put on equal to about 10 inches at the inlet of the governors. In the case of the supply to Caterham, the gas is sent direct at this pressure through one of the mains, and is governed down when it reaches that district. Passing through the valve-house, where the whole of the gasholders are regulated, the visitors next came to the extensive stove repairing shops. Mr. Helps finds there are objections to simply painting stoves after they have been repaired; and so he has put down an enamelling furnace, by means of which (as he clearly demonstrated by the large number of samples which were on view) he is able to turn old stoves into new. Above are the tin and lamp and brass shops (divided off from each other by clear glass partitions, which are an aid to efficient supervision), offices, &c.

It was here that Mr. Helps invited his guests to take tea with him, after which a few speeches were made.

The PRESIDENT (Mr. W. J. Liberty), in proposing a vote of thanks to Mr. Helps for his kindness in showing them round and for his hospitality, and also to his assistants for the trouble they had taken, remarked on the enormous district covered by the Croydon Gas Company—about 80 square miles. They found, he said, at these works the old and the new standing side by side—the latter giving them the very last word on gas-works construction. There they saw the embodiment of all the knowledge and experience of Mr. Helps, who had been at the helm for 25 years. It was to him that the credit belonged for all the improved and up-to-date methods they had witnessed. The capital charges of the Company, he noticed, were at a low figure per 1000 cubic feet; and this proved that they were visiting a good gas-works. Thirty years ago, when he knew the district intimately, the question of the purchase of the works was discussed by the Local Authority; but they never came to terms—a result for which the consumers must be thankful. Since the Association had last visited the works, the Company had adopted co-partnership; and as a firm believer in this principle, he was delighted that they had done so. They were very grateful to Mr. Helps for having devoted his Saturday afternoon to them. There were many instructive things to be seen; and he had been particularly struck by the vacuum process for emptying the syphons.

The SENIOR VICE-PRESIDENT (Mr. W. A. Barnett), in seconding the vote, remarked that there were very few works they had been to where they had seen the last word in gas manufacture as they had at Croydon. Now that the Company had taken up co-partnership, he thought they had done everything that could be done both on the manufacturing and the commercial side. He had lately looked up a paper read by Mr. Thomas Travers, of Cork, in 1882, before the Gas Institute, on the subject of "Industrial Co-Partnership;" and it was surprising to see how many difficulties were then anticipated. Since that time, however, through the late Sir George Livesey, the idea had been brought to a successful issue in some works; and he believed it was likely to go forward making fresh converts. In fact, it must do so when once the advantages were thoroughly understood.

Mr. F. C. CANNING, in supporting the proposition, said they had all learnt something from the novel processes and new ideas they had seen. They had witnessed how gas manufacture could be carried on side by side with the greatest cleanliness and orderliness. Mr. Helps waged war against two things—against dirt and against naphthalene.

Mr. H. AUSTIN, one of the Workmen Directors of the South Metropolitan Gas Company, who also supported the vote, made some spirited remarks in favour of co-partnership. He pointed out that in the case of his Company the dividend in a single twelvemonth to the workmen alone amounted to between £12,000 and £13,000; while they had received over £76,000 by way of dividend since the scheme was started.

The PRESIDENT, in putting the proposal (which was carried with acclamation), said that in 25 years the output of gas at Croydon had increased five times, and during the past ten years it had doubled.

Mr. HELPS thanked the members very much for the vote, and said it had been a great pleasure to him to receive them—though there were not many people for whom he would give up his Saturday afternoon. His assistants had also been pleased to do what they had, because they all felt honoured that the Association had selected the works for one of their excursions. Nowadays there was a great deal of competition; but they in the gas profession were not beaten yet. They were going to "keep their end up" for a long time to come. If the members had seen any ideas there which they thought were good, they were quite welcome to them. What was good for one works was good for the industry at large; and if any of them had got a good thing, they should let others benefit by it. Co-partnership had been in the air a good deal at Croydon lately. They were new recruits; but they were not new in looking into the question. Now that he had felt in a position to recommend it, the Directors had given the matter most careful consideration, and had adopted a scheme. At a meeting some time ago, when the resolution was put about co-partnership, every man's hand went up in favour of it, and it was received with acclamation. On the previous night, they held their first Co-Partnership Committee meeting; and a very pleasant episode occurred. A day or two before, he had had a bronze bust of Sir George Livesey sent down to him by the sculptor, who asked if they, as a co-partnership Company, would like to buy it. Well, at the meeting one of the Committee suggested that a photograph should be taken of the bust, and copies sold at (say) 6d. each, which would provide the money to buy the bust, and allow every man to have in his house a picture of the originator of their co-partnership system. The matter had not yet been before the Board; but he mentioned it as an interesting episode. When he joined the Company, the make of gas was 270 millions; he thought this year the output would be between 1300 and 1400 millions. The business had therefore grown; and in spite of the money that had been spent, the capital, which when he came there was over £8 per ton of coal carbonized, was now only just over £5 per ton. When he and his assistants heard the compliments that had been paid to the works, they felt more than repaid for any trouble they had taken in showing the members round. He hoped at some future date—when they had remodelled the old section—to have the pleasure of welcoming the Association there again.

STRESSES AND STRAINS IN GIRDER WORK.

The Association of Engineers-in-Charge, at their meeting last Wednesday, had read to them by the Vice-President, Mr. Henry Adams, a valuable paper, illustrated by numerous lantern slides, on the subject of "Stresses and Strains in Girder Work," in which the author commenced by describing the true use of the words "stresses" and "strains."

He said it was interesting to note that from the time of the Britannia Tubular Bridge, 1845, when the theory of stresses first received general attention, to about the year 1880, it was customary to speak of the stresses in girder work as strains; so that Mr. F. Wentworth Shields' book on "Strains in Ironwork," and his own lectures to the Society of Engineers, with the same title, which dealt solely with stresses, did not at that time seem improperly named, as draughtsmen were in the habit of describing their preliminary work in designing a bridge as "taking out the strains," and as many of the leading "iron-men" in the various railway engineers' offices were old students of his, he was afraid he must be held responsible for helping to keep up the misnomer. However, in the lectures he had referred to, he gave a full description of the true use of the terms; and this he recapitulated as follows: "By a load on any member of a structure is meant the aggregate of all the external forces acting upon it, including the weight of the member itself, and of other parts supported by it; by a strain is meant the change of form produced in a piece by the action of a load; and by a stress is meant the resistance set up in the material, by its molecular forces opposing the action of a load in producing a strain. Thus the strength of a piece in a given position may be such that a load of so many pounds produces a stress of so many pounds per square inch; the result being a strain, or change of form of a certain amount, whether temporary or permanent, and, when large enough, appearing as stretching, shortening, bending, crumpling, or twisting. The term strain is commonly used instead of stress, and is usually meant as such when we speak of the calculation of strains; so that, though we may use this term as an ordinary office phrase, we must bear in mind the distinction when we make a systematic study of the subject." The various kinds of strain that may come upon a structure, he said, are: Tension—stretching, pulling, and tearing. Compression—crushing, pushing, and squeezing. Shearing—cutting and nipping; or when acting along the grain of wood it is called detrusion. Transverse

strain—cross strain, bending, and deflection. This strain may be resolved into tension, compression, and shearing. Torsion—twisting and wrenching. This strain is a form of shear belonging almost exclusively to machinery. Buckling or crumpling is a compound strain made up of crushing and bending.

Referring to the subject of bending moments, the author said that a bending moment is the effect of a load, or its reaction at the supports, multiplied by the leverage with which it acts. In other words, it is the active part of the calculations, or the effort, as distinguished from the resistance due to the nature of the material and the disposition of its parts. The bending moments, however, he added, do not tell us all the action that is taking place. We have also to take account of shear—a matter which does not always receive due consideration. Many of the failures in early ferro-concrete work were due to the neglect of shear; and only recently the question of shear in masonry dams has been subject to investigation by many distinguished men.

GAS AT THE NURSING EXHIBITION.

Where there is a prospect of business resulting either directly or indirectly, there are the Gaslight and Coke Company to be found; and it is, under these circumstances, not surprising to find that they were represented by an excellent show of gas lighting and heating appliances at the Nursing Conference and Exhibition, which was held last week at the Grafton Galleries, Bond Street, W. Such an occasion promised a first-rate opportunity of impressing upon those connected with the medical profession the hygienic and collateral advantages of gas; and full advantage was taken of this by the provision of a plentiful supply of up-to-date, attractively prepared literature. So far as could be seen, the only gas in the exhibition was to be found at this stall; and it is therefore all the more pleasing to record that the display made by the Company was a good one in every respect.

All the lighting was on the inverted system; the fittings being of artistic design, by Messrs. Messenger and Son. The doctor's bracket—which is made to move in any direction, and is provided with an incandescent burner and a powerful reflector—also found an appropriate place upon the stall. As to water-heating appliances, there were to be seen a Wilsons and Mathiesons circulator for attachment to existing hot-water systems, geysers of the Ewart and Maughan type, a Richmond "Avon" heater for a hand-basin, to give a constant supply of hot water, and a neat looking little Ewart lavatory apparatus fitted with an overhead spray. Cookers were represented by Sugg's new pattern "Westminster" stove. There were also a very neat Fletcher enamelled griller, white inside and blue outside, and a Richmond nickel-plated hot-plate for toasting and boiling. There was an excellent show of fires, including Richmond's nursery pattern, with a boiling-burner at the top for a kettle, so as to save labour in going up and down stairs for hot water; the same firm's "Assyrian" drawing-room fire; Wright's new pattern "Thermo" fire-front stove; and a selection of Parkinson's, Davis's, and Main's bedroom fires. An air of completeness was given to the stand by the display of attractive copper culinary utensils.

Midland Association of Gas Managers.—We are asked by the Hon. Secretary (Mr. Harold E. Copp, of West Bromwich) to announce that the spring meeting of the Midland Association will be held at Longton on Thursday, the 20th prox.

The Malam Family.—In the obituary notice of Mr. George Malam, of Dumfries, which appeared in the "JOURNAL" for the 6th inst., it was stated that his father was a native of Yorkshire. Referring to the matter, our Scotch Correspondent writes: The Malams seem to have been early a family of inventors in gas appliances. A friend has just told me that there is an invention known as "the Malam wheel" in connection with gas-meters. I suppose this is the invention which is described as having been brought out in 1817 by "the very ingenious John Malam." It is described as "an instrument for measuring gas, which undoubtedly led to the construction of meters so universally employed and so justly appreciated." The publication from which I am quoting goes on to say: "However, Malam, from some unaccountable cause, never patented his invention; and as early as 1818 Clegg and Crossley abandoned their mode of constructing meters for that invented by the first-named gentleman. On the occasion of his meter being presented by Malam to the notice of the Society of Arts, Clegg asserted that it had been copied from him. This serious charge was investigated by a Committee of the Society, who ultimately, after great deliberation, gave their verdict in favour of Malam, by awarding him their gold medal 'for his invention of a gas-meter, new, ingenious, superior to all others, and likely to be of great benefit to the public.' The extraordinary originality of inventions since displayed by Malam has confirmed the decision of the Society of Arts." I find in the "Mechanic's Magazine," published on Oct. 11, 1823, in the list of new patents, there is the entry: "To John Malam, of Wakefield, Yorkshire, engineer," for his mode of applying certain materials, hitherto unused for that purpose, to the construction of retorts and improvements in other parts of gas apparatus.—18th August." So that, assuming the John Malam mentioned in both publications to be the same, it would appear that the lesson he received in connection with his meter invention was not without effect when he came to bring out another.

VALUATION OF COAL-TAR PITCH.

At the recent Annual Meeting of the Manchester Section of the Society of Chemical Industry, Mr. W. H. Coleman read a short note on this subject. According to an abstract in the "Chemical Trade Journal," he referred to the lack of precision in the methods of testing at present in use, and described a method for determining the "dropping-point" of pitch, which, according to the results arrived at by different experimenters, certainly showed a great improvement with regard to accuracy, and eliminated to a great extent the personal equation.

In the discussion which followed, Mr. Clayton said the present methods of testing tar products were extremely unsatisfactory, considering the large extent of their manufacture. For instance, the average briquette manufacturer bought his pitch as cheaply as possible, and then used 9 per cent. of it, irrespective of its origin, taking no account of the free carbon present. He said he should think it would be to the manufacturers' interests, when buying pitch, to adopt some method of testing it. Dr. Bailey asked if the speaker would detail some of the distillation methods of testing pitch. In replying, Mr. Coleman said one of the problems was to ascertain the amount of solid matter deposited at a definite temperature by creosote. It was possible to find this out by using creosote containing some other body, the amount of which could be easily ascertained; and he instanced tar acids. Dr. Skerrow suggested that the delegates at the Seventh International Congress of Applied Chemistry, to be held next month, should deal with the standardization of the existing methods of testing pitch. Mr. Hermann asked if it did not seem that the pitch had to be made too soft before the result could be arrived at by the new method. For instance, in testing a pitch to be used for road-making, this would, in his opinion, be the only drawback to the test. Dr. Bailey questioned whether it was not possible for someone to invent a method so that the same results from the experiments might be obtained at the ordinary temperature. Replying to Dr. Bailey, Mr. Coleman said his suggestion was a good one; but as pitch when cold was extremely brittle, he was doubtful whether the tensile strength could be properly arrived at. In regard to the pitch test for road-making, he felt he could rely on the results obtained by the method described.

ELEVATED WATER RESERVOIR AT CALCUTTA.

In the "JOURNAL" for the 26th of January last, we recorded that Messrs. Clayton, Son, and Co., Limited, had secured the contract, at a price of £91,367, for a huge steel tank for the supply by gravitation of water for domestic and other purposes to Calcutta. The special feature of the tank is that it will stand at an elevation of 90 feet above the ground level, and be supported on steel trestles. It forms an important constituent of a scheme of improved water supply for the city devised by the Chief Engineer to the Municipality (Mr. W. B. MacCabe, M.Inst.C.E., formerly Chief Water Engineer to the Dublin Corporation) by which provision is made for a present delivery of 30 million gallons per day, and an ultimate addition of 10 million gallons. As the structure above referred to is the largest steel water-tank in the world, it may be of interest to give a few more particulars concerning it, from a report furnished by Mr. MacCabe to the Corporation when he proposed his scheme.

In the first place, Mr. MacCabe explains the necessity for the erection of the tank, and then offers a few remarks on the functions it will discharge. As already mentioned, the scheme provides for an ultimate supply of 40 million gallons per day, and, were it possible to deliver this quantity to the consumer at a uniform rate throughout the 24 hours, there would be but little difficulty in the distribution of the water, as the pumping machinery would be arranged to work at one constant head and speed. As a matter of fact, however, the demand varies within very wide limits; for it fluctuates from a rate of (say) 7·5 gallons per head at night time to about 75 gallons per head during the hours of maximum demand in the day. This high degree of fluctuation between the minimum and maximum demand renders it also necessary to provide for an exceedingly elastic method of supply, which must be capable of varying automatically with requirements. The present system of pumping direct into the mains is singularly inelastic, and cannot satisfactorily cope with the maximum demand; and the result has been that the supply fails just at the moment when the need for it is most urgently felt, while it is copious during the night hours when the demand is at a minimum. The high degree of elasticity required can only be secured by the force of gravitation, which, provided that the system is designed to meet the maximum demand, will automatically adjust itself to anything short of the maximum.

From what has been said, it will be clear that both the requirements of an adequate reserve and of elasticity can best be satisfied by creating a reserve at a sufficient elevation to supply the whole city by gravitation. Were there natural hills or high ground within reasonable distance, reservoirs could be constructed at a sufficient height for the purpose, and of sufficient capacity to balance the difference between the average supply and the maximum demand. Unfortunately, the absence of any natural eminence in the neighbourhood of Calcutta rendered it necessary to construct an artificially elevated reservoir.

In considering the dimensions of such a reservoir, it was desirable to provide for future maximum requirements, which during the four hours of maximum demand would amount to 16·5 million gallons. Of this quantity, 6·6 million gallons would flow into the underground reservoir—leaving about 10 millions to be provided as storage. The underground reservoir contains 8 million gallons; but as it is necessary to retain a reserve in case of accidents, not more than 3 million gallons could be counted upon from this source. It was thus necessary to provide storage in the raised tank for at least 7 million gallons. In order to leave a margin of safety, its capacity was fixed at 9 million gallons.

It now remains to describe the construction of the work. Briefly, the reservoir consists of a steel tank 15 feet deep and 321 feet square, supported on steel columns; the height from the top of the tank to the ground level being 110 feet. It is divided into four compartments which can be used independently of each other, so that one or more can at any time be thrown out of use for repairs or cleaning, without any interruption in the supply of water to the town. The bracing is of special design, enabling a considerable saving in weight of material to be effected without any loss of strength. Provision for expansion and contraction is made by leaving the bottom flexible, so that the only effect of changes in temperature will be that the slight sagging of the bottom, which will take place between each pair of the supporting joists, will slightly increase or diminish as the temperature rises or falls. This will eliminate all tendency to "creep;" and it is claimed that this is the cheapest and most effective way in which this could be done. The 60-inch pipe which will act both as an inlet and an outlet pipe, will be fitted with an effective expansion joint, to prevent straining of the pipe or bottom of the tank.

To protect the water from possible contamination and to keep it cool, the tank will be provided with a flat terrace roof, consisting of $2\frac{5}{8}$ inches of fine concrete carried on slates laid between steel rafters, which in their turn are carried on steel joists supported by steel columns from the bottom of the tank. To make the roof water-tight, a sheet of Callender's bitumen will be laid over the whole area between the slates and the concrete; and to prevent birds entering the tank through the ventilating spaces, all means of ingress will be closed by brass wire netting of small mesh. The maximum load on each vertical member of the substructure of the tank will be 200 tons; thus giving a maximum load of 800 tons on each of the sets of four braced verticals. Under each vertical member is a shoe for distributing the load, and reducing the weight per square foot on the surface of the concrete under each vertical member to 6 tons per square foot, which is quite safe for reinforced concrete. The load on the soil under the concrete foundations will only be about 0·6 ton per square foot, which leaves a large margin of safety even in bad ground such as exists in Calcutta.

The important matter of the foundations of the tank naturally received much attention. The site contains a number of old tanks. Those which are beneath the foundations are to be emptied, piled, and filled in; while those on or near the edge of the foundations are to be piled where necessary and filled in, and a retaining wall constructed to prevent any lateral displacement of the soil. The west side of the foundation, next the existing Tallah reservoir, is also to be piled throughout its length. The foundation itself is on the grill reinforced concrete system, and consists of a bed of concrete 2 ft. 6 in. thick, reinforced at its base with a system of flat ties which cross each other at right angles beneath the supporting columns of the tank. Near the surface of the concrete bed, steel joists are to be built in, corresponding exactly to the flat ties below; and upon these joists the bases of the columns will rest. The whole foundation forms a system of which the ties become the lower or tension members, and the joists and concrete take up the compression, and spread the weight over the whole area of the foundation. As an additional precaution, a dwarf wall is to be constructed completely surrounding the tank, extending from the surface of the concrete foundation to a depth of about 4 feet below the level. This wall will be of concrete, reinforced with expanded metal, and will form the outer edge of the foundation, which is a costly one, as the whole of the concrete will be in cement. But, in view of its paramount importance, and the known deficiencies of the soil of Calcutta, the expenditure is considered to be justified.

The Gas-Mantle Industry.—According to a paragraph in the Engineering Supplement to "The Times," the manufacture of incandescent mantles in Germany reached its highest point in 1906-7, and has recently declined, owing to the fact that England, France, the United States, Italy, Austria, Russia, and other countries have established factories. The industry, however, is still to a great extent in German hands, and the majority of the more important factories are established near Berlin. Competition between German manufacturers has brought down the prices of mantles until it now seems impossible to supply a really good article at a lower figure; but the difference between a first-class mantle and one of an inferior quality is very marked. At present the maker who uses only the best material and the most skilled labour, in order to supply a good article, suffers, because the public do not understand the nature of this difference in quality. The annual production of mantles for the whole world is distributed as follows, the figures referring to millions of mantles: Germany, 100; America, 55; Great Britain (including the Colonies), 35; France, 15; Austria, 3; Italy, 2; Belgium, 2; Russia, 1.

REGISTER OF PATENTS.

Gas Cooking-Stoves.

DAVIS, H. N., of Luton.

No. 4656; March 2, 1908.

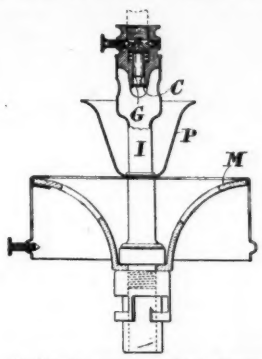
In cooking-stoves as at present in use, the gas and air are supplied to the oven (the patentee points out) either from the outside or inside; but he proposes to fix the gas and air regulator in a recessed position and flush with the outside of the cooker, and fix the pipe of the gas supply, which passes through the regulator, on the inside of the oven-frame—the air being supplied from the outside, and regulated by an air-shutter.

Inverted Incandescent Gas-Burners.

WEBBER, J., of Salford.

No. 7221; April 1, 1908.

Upon the end of the ordinary gas pipe or conduit is attached a valve fitting for controlling the flow of gas to the burner, by a conical needle or pointed part C forming the lower end of the sliding-piece in the valve casing. Into a slot in the head of the sliding-piece there projects a pin on the end of a finger screw or stud which passes through the valve casing. The valve seat is provided by the washer or disc attachment G. The sliding-piece, having the pointed valve part C



Webber's Inverted Gas-Burner.

formed at its lower end, is normally held up to an abutment peg by a spring which is forced down when adjustment is effected by the screw. Grooves are formed along the sliding-piece to permit of the passage of gas. The lower end of the valve fitting has secured to it the bunsen tube I provided with the usual mixing-chamber, with its wire gauze or other screen therein for effecting mixing the gas and air.

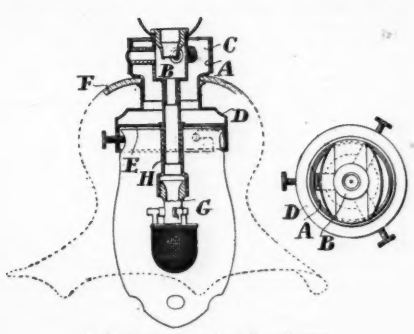
The mantle-carrier, screwed on to the lower end of the bunsen tube, serves also the purpose of supporting the cone M (of china or other material) for the deflection of the light from the mantle. The cone is provided with apertures for allowing the hot gases to pass to and heat the tube I and its contents, and supports an ornamental globe-carrier. An ornamental fitting P on the bunsen tube at or about the position shown shields the air-inlet apertures from the hot rising gases.

Inverted Incandescent Gas-Lamps.

ZECHNALL, L., of Bunhill Row, E.C.

No. 10,321; May 12, 1908.

According to this invention, the lamp consists of an upper member having the usual gas and air mixing-chamber; separate passages being provided for the inlet of fresh air to the mixing-chamber and for the escape of the products of combustion respectively. A bunsen tube projects downwardly from the mixing-chamber, and a carrier is detachably secured to the upper member for supporting the globe surrounding the mantle. Means are also provided for removably attaching a shade or reflector to the upper member. The arrangement is such that the products of combustion pass up in a space formed between the bunsen tube and the shade-carriers, and made of such length as to enhance the draught.



Zechnall's Inverted Gas-Lamp.

In the form shown, the lamp consists of an upper cylindrical member A within which is disposed the air and gas mixing-chamber B so as to form an annular space C between them. The mixing-chamber is supported in a concentric position by tubular arms, through which the air supply to the mixing-chamber is led in the usual way; the fresh air

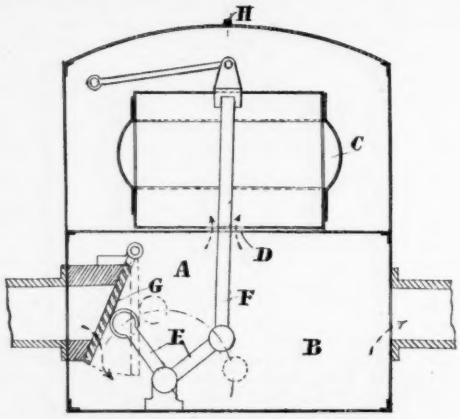
supply being isolated from the annular space C through which the products of combustion escape. An air-regulator is slidably mounted on the outside of the member A; and the lower part of the upper member A is made of reduced diameter and adapted to support a removable gallery D, provided with bayonet slots for receiving and supporting the globe-carrier E. The upper part of the gallery also serves to clamp a shade or reflector F between it and the underside of the upper member. In this form, the globe-carrier is also adapted to carry the burner-nozzle G; being provided with a central downwardly extended tube H, the lower end of which is fitted with the nozzle G, upon which the mantle is hung, and which tube slides over the bunsen tube for a suitable distance when the parts are assembled. By this means the globe-carrier tube, burner-nozzle, and mantle can be readily detached from the gallery or replaced thereon without interfering with the shade. The space between the bunsen tube and the parts A and D provides a flue for directing the products of combustion, so that on being discharged from the top the gas does not discolour the exterior of the fitting. The flue also provides a means for improving the draught and, consequently, the efficiency of the burner.

Gas Pressure-Controllers.

LANTONNOIS, G., of Ypres, Belgium.

No. 11,433; May 26, 1908.

This invention relates to a gas pressure regulator of the kind having a collapsible chamber actuating a regulating hinged door through levers and links; the essential feature consisting of a bell-crank lever arranged to oscillate on its elbow and one arm of which frictionally engages the hinged door, while the other arm is pivotally connected to the top of the collapsible chamber.



Lantonnois' Gas-Pressure Controller.

The chamber A contains gas under high pressure; and chamber B gas under low pressure. The bellows C (of leather) communicates with the chamber B through an opening D. When the pressure is lowered in the chamber B below the desired reduced pressure, the bellows will be flattened to a correspondent extent and cause the lever E to swing through the agency of the connecting rod F, thereby opening the door G to a small extent. The door will be closed again as soon as the pressure of the gas in the chamber B is brought back to the normal degree. A minute opening H provided at the top of the apparatus permits of the circulation of air during the operation of the bellows.

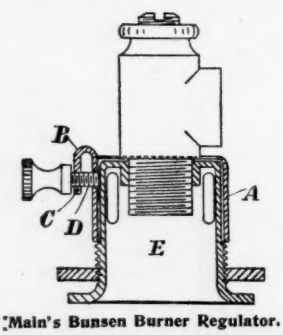
The desired reduced pressure is maintained at a constant degree in spite of the variations of high pressure and supply to the lower pressure conduct. The surface of the bellows and the lever E are calculated so that the door G cannot be opened unless the pressure in the chamber B is lowered below the desired reduced pressure, whatever be the high pressure acting on the door.

Air-Regulators of Bunsen Burners.

MAIN, R. B. & A. P., of Falkirk, N.B.

No. 12,838; June 16, 1908.

This invention relates to air-regulators for bunsen burners of the type in which a slotted or perforated sleeve fits around a slotted or perforated pipe or passage through which the gas supply flows; and it has



Main's Bunsen Burner Regulator.

for its object to provide a device for securing the sleeve regulator in any position in which it may be adjusted, while permitting of readily varying the adjustment.

The perforated or slotted sleeve A is formed with a projecting lug B, bent over to lie parallel with the body of the sleeve and tapped with a screw-thread at C. Through the tapped orifice a thumb-screw or screw-threaded pin D is passed; its point passing through a plain orifice in the sleeve and adapted to bear on the periphery of the inner pipe or tube E. After the sleeve is adjusted relatively to the pipe E to regulate the air supply, the screw is turned so that its end bears on the pipe; and by reason of the threaded engagement of the screw with the bent lug (which has a certain amount of spring), the lug is caused to bear against the head of the screw, and thus acts as a lock-nut. The thumb-screw D and lug B form a lever with which to turn the sleeve A.

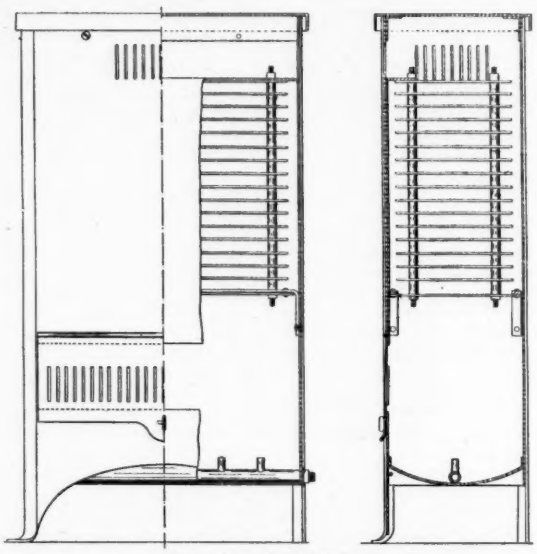
Gas-Radiators.

BERTHOLDT, C. R., of Norfolk Street, Strand, W.C.

No. 12,942; Dec. 9, 1908.

These radiators comprise a casing having a system of perforated baffle-plates in the upper part and gas-burners below.

The radiator casing is fitted inside with a system of flat metal plates or shelves formed with perforations. These plates are of relatively large area, as shown, and are spaced apart from one another and assembled together preferably by means of tubular-distance pieces and rods provided with nuts at the ends. The perforations in adjacent shelves are arranged so as to offer circuitous passages to the ascending heated air. The shelves are supported in the upper half of the casing by brackets or bridge-pieces, bolted to the lowermost plate and to the



Bertholdt's Gas-Radiators.

casing sides. The lowermost plate extends to the front, back, and sides of the casing; but all the other plates are made smaller so that a small space is left between their edges and the front, back, and sides of the casing, to prevent the ascent of the heated air from being too much retarded in the successive chambers formed between the plates by allowing air to escape from the chambers between the edges of the plates and the front, back, and sides of the casing, while also serving to prevent damage by overheating. In the lower half of the casing are arranged the gas-burners, and below the burners is a plate curved as shown, formed with a few perforations for the admission of air.

In operation, the air drawn in through the perforations in the curved lower plate is thoroughly heated in the lower half of the casing by the gas-flames, and the gas is thoroughly burnt in the hot atmosphere. The air then percolates through the perforations in the several plates; being continuously deflected, baffled, and retarded in its course, which ensures a most advantageous heating effect. The heated air finally escapes through apertures in the front and sides of the casing covered by a removable top.

Automatic Gas Regulators or Governors.

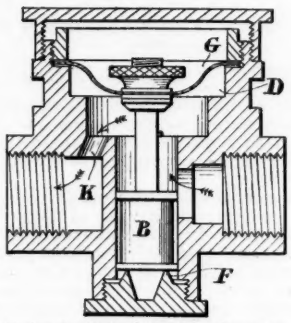
GOODSON, J., of Maze Pond, S.E.

No. 13,558; June 25, 1908.

This automatic gas-governor is of the kind described in patent No. 20,846 of 1906, wherein a piston valve and a controlling piston are connected with the valve. But, according to this invention, the controlling piston is replaced by a diaphragm, so that the friction is reduced.

As shown on p. 165, the barrel portion of the casing (with the inlet and outlet) is provided, as in the earlier patent, with a cylindrical valve-chamber formed transversely to the barrel, and receives the piston-like valve B—a small passage being formed through the valve so that the pressure in the valve-chamber above and below the valve always remains the same. The lower end of the valve-chamber is closed by a screw plug provided with a stop F having a circular knife-edge, which supports the valve when in its lowest position. Above the valve-chamber a co-axial diaphragm chamber D is formed for the reception of a diaphragm G, and communicating, through a separate opening K, with the outlet. The outer edge of the diaphragm is clamped gas-tight against an annular shoulder in the casing D by a ring which screws into the casing. At the centre a suitable strengthening or stiffening piece may be applied to the diaphragm, and likewise at the outer edge, to facilitate removal or insertion. By removing the cover ring and nut,

the diaphragm can be taken out or put in with equal facility; so that a worn-out diaphragm can be renewed.



Goodson's Automatic Gas-Governor.

In order to reduce friction, the middle of the valve B is turned to a smaller diameter than the ends, so that the surfaces in contact are as small as possible.

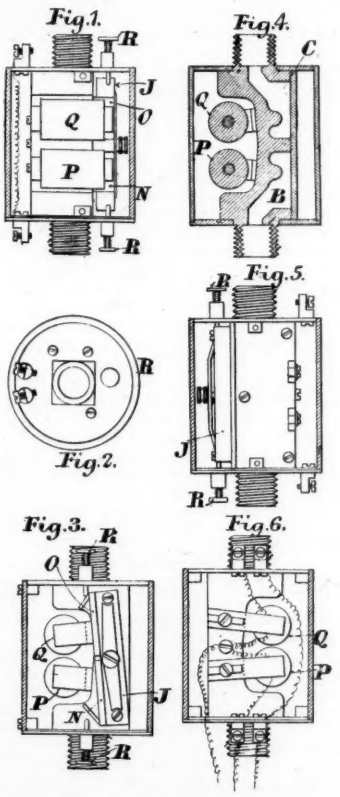
Electrically Controlled Gas-Valves.

BENARD, P., of Reims, France.

No. 13,772; June 29, 1908. Date claimed under International Convention, July 12, 1907.

This invention relates to apparatus for controlling electrically, from a distance or by hand, the opening for the gas-fed to gas-burners.

Fig. 1 is an elevation (the outer casing in section); fig. 2, a plan; fig. 3, an end elevation (the outer casing in section and the gas-check in the open position); fig. 4, a section of fig. 1; fig. 5, a rear view (the outer casing in section); and fig. 6, an end elevation, showing the connection of the wires.



Benard's Electrically Controlled Gas-Burners.

The apparatus comprises a metal chamber bent to horseshoe form, the interior of which forms two compartments B C separated by a partition. The compartments are connected, one to the inlet, the other to the outlet of the gas by threaded joints top and bottom. One side of the chamber is a smooth plate, ground and perforated with two slots corresponding to the two compartments B C. It carries a pivot on which oscillates a rectangular box J, perforated also with two holes registering with those in the chamber A. The two parts are held in contact by a plate spring, which serves to hold the two ground faces one against the other so as to ensure a tight joint. In one of the positions of the oscillator, the slots are superposed and effect communication between the compartments through the intermediary of the box J. In the second position the slots are covered up, and communication between the gas inlet and outlet is interrupted. The oscillations of the gas-check corresponding to these two positions are electrically effected by providing the oscillator on its lateral face with two armatures N O arranged respectively opposite the two poles of two one-legged electro-magnets P and Q placed in the recess formed by the metal block of horseshoe shape. When the electric circuit is closed through one of the two sets of wires, the current passes only through the electro-magnet P, and the poles of the latter attract the armature N. In this position the feeding of gas to the burner is interrupted. When, on the contrary, the electric circuit is closed through the other set of wires, the current passes only through the electro-magnet Q, and the poles of the latter attract the armature O. In this position the gas may be fed to the burner.

Two spring knobs or plungers R, acting on the inclined planes placed at the two ends of the gas-check, allow of the oscillatory movement being produced by hand in case of insufficiency or failure of the electric current.

The advantages of the apparatus consist essentially in the fact that the inlet and outlet of the gas may be in any direction, and that the gas does not circulate, nor even penetrate, either in the casing or around the opening and closing members. Besides, the apparatus only requires a very weak current for its operation, and ensures a tight joint.

Gas-Fires.

YATES, H. J., of Aston, near Birmingham.

No. 15,783; July 24, 1908.

This invention has for its object to enable gas-fire heating apparatus to be employed in conjunction with an ordinary fire-grate "without the disadvantages hitherto experienced." The patentee proposes to make the grate or frame of the gas-fire of such a shape that it can be placed compactly against an ordinary fire-place. A rectangular frame, formed with a hollow back and adapted to fit over the fire-bars and canopy of the grate, is found most generally convenient; and along the two sides and the top of the gas-fire grate junction strips are secured and arranged to abut against the grate behind. To adapt the strips to any grate of ordinary type, they are made adjustable with respect to the gas-fire grate, or are hinged to it, and when in the required position are fixed by screws. For covering the gaps at the top corners of the strips, cap pieces are secured by screws; the strips being slotted to permit any required adjustment of the caps.

Gas Cooking-Stoves.

PIRRIE, W. H., of Great Winchester Street, E.C.

No. 18,037; Aug. 27, 1908.

This invention relates to gas cooking-stoves of the type in which a water-heater is provided in connection with the hot-plate. In such stoves, as heretofore constructed (the patentee mentions), the gas-burners have been placed as close as practicable to the hot-plate; but "if the burners are near enough to give a rate of heating similar to that obtained over an open burner, as in an ordinary gas-cooker, there is imperfect combustion of the gas, causing both danger to health and loss of heating efficiency." Also the rapid heating of vessels placed upon the hot-plate is seriously impeded by the great amount of heat taken up by the hot-plate by conduction. In addition, in stoves wherein the hot-plate is continuous in surface (spaces being left which are covered by the vessel to be heated or by a plate in the absence of a vessel), "imperfect combustion arises owing to there being insufficient passage for the heated products of combustion from the neighbourhood of the burners."

The claim for the present invention is for a gas cooking-stove in which a water-heater is provided in connection with the hot-plate having the gas-burners placed at such a distance below the hot-plate that the flame is not in contact with it; means being provided whereby the cooking-vessels, on being passed through the aperture in the hot-plate, can be supported over the burner at a suitable distance above the burners, and sufficient space being provided between the cooking-vessels and hot-plate to ensure sufficient natural draught. Flanges extend entirely round the vessel, which is provided with ribs or is perforated for supporting the cooking-vessels, so that conduction of heat from the cooking-vessel to the hot-plate and water-heater is avoided. The cooking-vessels are supported by flanged openwork cylinders; and means are provided for regulating the vertical distance between the gas-burners and hot-plate.

Pyrometers.

NORMA COMPAGNIE, G.M.B.H., of Wurtemberg, and KIRNER, J., of Stuttgart, Germany.

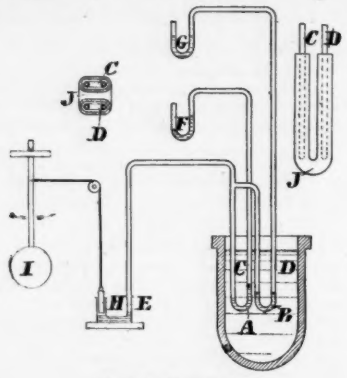
No. 27,245; Dec. 15, 1908.

In a pyrometer according to the present invention, the fusible substance employed does not require to be replaced, and therefore any desired number of measurements may be performed with a single charge, and, in addition, the temperature at any part of a furnace can be measured, it is said, without trouble. The inventors propose to enclose the fusible substance in communicating tubes within the furnace, and the process of fusion takes place in the tubes instead of, as heretofore, in the furnace itself. By this arrangement the saline matter may be repeatedly used over again. Combined with the feature just referred to, there may be provided means to render the change in the condition of the fusible substance more apparent.

In the preferred arrangement of a pyrometer constructed according to this invention, two sets of communicating tubes—*i.e.*, two U tubes—are employed; the tubes or limbs on one side of the fusible substance being in connection with the means for imparting movement to the saline matter when it melts, and the other tubes or limbs on the other side of the saline matter being provided or in connection with separate indicating means on the outside of the furnace. When it is desired to maintain the temperature of a furnace between two given points, each U tube may contain saline matter of a different fusing point corresponding with the highest and lowest limit of temperature required in the furnace; and then, by maintaining the furnace heat so that the fusible substance in one tube is melted while the saline matter in the other tube remains solid, the required heat is ascertained.

The illustration on p. 166 shows a construction of the pyrometer, in which a varying air pressure is exerted on the saline body. A and B are fusible substances, the fusing points of which correspond with the limits of temperature desired in the furnace, in the bottom of U-shaped

tubes C D, one limb of each of which is connected with the pressure chamber E. Each of the other limbs of the tubes is connected with a pressure-gauge—for example, with transparent tubes F G filled with liquid. A varying air pressure is set up in the pressure-chamber by a plunger H arranged to move up and down in a second tube or cylinder in communication with the pressure-chamber and filled with some liquid. The plunger is operated by the pendulum I.



Kirner's Pyrometer.

The pendulum is set in motion, and the indicator tubes watched. When the liquid in communication with the fusible substance begins to move up and down, it necessarily shows that the body has liquefied, and, consequently, that the temperature has risen above the fusing point of the saline matter. When the liquid in one of the tubes ceases to pulsate, then the temperature to be measured has fallen below the melting point of the corresponding saline body. If it be desired to maintain the temperature of a furnace between two given points, the fusing point of the saline matter is made to correspond respectively to the highest and lowest limits of temperature desired, or *vice versâ*. After the lowest temperature is exceeded, the liquid in the one tube which corresponds to the saline matter of the lowest fusing point will pulsate and indicate that the minimum temperature has been exceeded. To maintain the furnace at the desired intermediate temperature, the liquid of one tube should pulsate as described, while the other remains stationary to show that the highest temperature is not reached.

The tubes C D may be placed within protective tubes, a special advantage of which is that they do not have to be welded together. For this purpose, in the case of the present pyrometer, the protective tube may be simply formed of a tube ⌋ bent U-shaped; the communicating tube, charged with the saline body for the minimum temperature, being inserted in the one limb, and that for the maximum temperature in the other limb of the tube.

Incandescent Gas-Lamps.

STILL, E. H., of Charles Street, Hatton Garden, E.C.

No. 28,560; Dec. 31, 1908.

The objects of this invention are to ensure that the gas-nipple of (say) a railway carriage lamp having an inverted incandescent burner shall remain cool while the lamp is in use, and to enable such lamps to be adapted to be employed with inverted incandescent gas-burners.

The chimney described in patent No. 5031 of 1908 is formed above the reflector body with a lateral opening; and a mixing-tube (secured to the chimney by screws passing through curved lugs or ears) projects into the chimney, where it is downwardly bent, and is adapted to support an inverted incandescent gas-mantle. But according to the present invention, the outer end portion of the mixing-tube is approximately horizontal, and terminates opposite a gas-nipple carried by a tubular bracket fitting rigidly secured upon the upper side of the reflector. The gas supply-pipe that is usually pivoted to the bracket outside the carriage roof is provided with an enlarged or flanged end which, when the pipe is swung down after the reflector and chimney are in place, is secured to the tubular bracket fitting in a gas-tight manner. The air-passage around the gas-nipple is adjusted by means of a sleeve which can be adjusted towards or from the nipple and fixed in position upon the ends of the mixing-tube by a set-screw.

Lighting of South Dublin Union.—The Dublin Board of Guardians have adopted a resolution brought forward by Mr. Shields, to the effect that they accept the tender of the Alliance and Dublin Consumers' Gas Company for the lighting of the South Dublin Union, at a cost of £1142 9s. 7d.; cost for cooking purposes, £390; and cost of installation of new lights, £364 0s. 8d. for a period of one year, "inasmuch as it is not advisable to incur thousands of pounds outlay in dealing with electricity, owing to the threatened changes by the Government in the poor law system; and that all orders to the contrary be rescinded." Mr. Shields, in submitting his motion, quoted figures to show that they would not be able to light the Union with electricity on the estimate already accepted. Gas, in his view, was the illuminant to be preferred for the lighting of the house; and he was of opinion that its use would be a saving of expense, particularly when they had regard to the heavy cost of putting down an electric installation. At the end of twelve months they could reconsider the merits of the two illuminants. His opinion was that on the security of any wiring or plant they might introduce for electric lighting, they could not get a loan for more than ten years. This decision was come to in spite of a statement by the Lighting Committee of the Corporation that they had started arrangements for laying cables on the strength of the agreement previously come to between the Board and the Corporation for the lighting of the premises by electricity.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Cooking by Gas and Electricity.

SIR,—As we venture to think that anything dealing with the comparative merits of gas and electric cooking apparatus is of great interest to your readers, we submit hereunder some figures which are the result of the most careful scientific tests carried out in our laboratories during a period of some weeks past.

According to the returns which were published in the "JOURNAL" for March 9, the average calorific value of the gas supplied during 1908 by one of the large London Companies was 626 B.Th.U. per cubic foot. This, at 2s. 3d. per 1000 cubic feet, gives 37 cubic feet per 1d., which is equal to 23,162 B.Th.U. per 1d., against 3437 B.Th.U. from one unit of electricity at 1d. Thus it will be seen that the user of gas can lose five-and-a-half times as much heat as the user of electricity has available and still have more left; the heating values always being: Electricity, 1; gas, 6·7.

To check these figures as applied to cooking-ovens, tests were made by us with (1) an up-to-date electrical cooking-oven, (2) an up-to-date single-cased gas-cooker, and (3) an up-to-date double-cased gas-cooker, with the following results:—

Electrical-Cooker.

Oven dimensions, 14 in. by 12½ in. by 10½ in. = 1837 cubic inches.
Heat raised in ten minutes from 61° to 390° Fahr., giving a rise of 329°.
Current used in ten minutes, 0·249 unit, giving an hourly rate of 1·494 units, which at 1d. per unit is equal to 59·75 cubic feet per hour at a local price of 2s. 1d. per 1000 cubic feet.
To maintain this cooker at a temperature of 420° (a rise of 359°), the hourly consumption was 0·532 unit; being equivalent to 21·3 cubic feet at 2s. 1d. per 1000 feet.

Single-Cased Gas-Cooker.

Oven dimensions, 14 in. by 12 in. by 12 in. = 2016 cubic inches.
Heat raised in ten minutes from 46° to 460° Fahr., giving a rise of 414° with 2·66 cubic feet of gas, which is equal to 16 cubic feet per hour.
The temperature was maintained at 440° Fahr., a rise of 396°, with an hourly consumption of 11 cubic feet.

Double-Cased Gas-Cooker.

Oven dimensions, 14½ in. by 15½ in. by 25 in. = 5618 cubic inches.
Heat raised from 56° to 600° Fahr., and maintained at a rise of 544° with an hourly consumption of 18·5 cubic feet of gas.

After making these three tests of cookers for heat maintenance, we treated each set of figures by multiplying the cubic capacity by the rise of temperature maintained, and divided the result by the hourly consumption, thus obtaining the following comparative factors:—

Electrical-cooker	30·960	equivalent to	100
Single-cased gas-cooker . . .	72·570	,,	234
Double-cased gas-cooker . .	165·190	,,	533

We think the figures furnished by our tests are sufficient to prove that cooking by electricity is still far and away more costly than cooking by gas, in spite of the claims which have recently been made by those interested in electrical apparatus. This is abundantly apparent even when the gas apparatus used is the simplest form manufactured—namely, the single-cased cooker.

Were it not for the fear of trespassing upon your space to too great an extent, we could furnish further figures in relation to water-heating by gas as compared with electricity, which would show even more astonishing results in favour of gas.

DAVIS GAS-STOVE COMPANY, LIMITED,
CYRIL G. DAVIS, Managing-Director.

Luton, April 17, 1909.

Position of the Cromer Gas Company.

SIR,—Although I hesitate to ask for any of your valuable space to deal with a personal matter, I think that a slight error which occurred in your report of the annual meeting of the above Company may give a false impression as to the attitude of the shareholders towards the Directors. In the paragraph (p. 40) you say the Directors' report was adopted except in regard to a recommendation as to a payment to myself. This point was certainly discussed at some length; but when subsequently put to the vote the recommendation of my co-Directors was carried *nem. con.* Moreover, many flattering remarks were made in regard to my services on the Board, which, though naturally gratifying to myself, were more important in that they showed the shareholders' confidence in the new policy adopted by the Directors during the past year.

Owing to the competition of the electricity undertaking (which is still trading at a loss, and therefore competing on unfair terms), the advancement of the Gas Company's business is slow. On the other hand, it is sure; and when our competitors are tired of losing money, and either raise their price to a paying level or give up what, in a small holiday resort like Cromer, is a hopeless struggle, there will be a chance for both shareholders and consumers to secure better results as regards dividends and price of gas respectively. It is not necessary to explain to your readers the fact that competition such as exists in Cromer means a higher price of gas, and not, as is popularly supposed, a lower one.

PERCY GRIFFITH.

54, *Parliament Street, S.W., April* 6, 1909.

Informal Meeting of Scottish Gas Managers.

SIR,—At the above meeting, you report me to have said (during the discussion): "When I went to Montrose, I started gas-fires, but after two years' experience I had to discard them." What I did say was: "When I went to Montrose I started hiring gas-fires; but after two

years' experience I had to discard the hiring system." You will see that, according to your report, I am supposed to have discarded the use of gas-fires altogether, which is not the case, as we sell these at cost price to our consumers and fix them free.

There is also an error in the number of new consumers I am credited with having obtained as a result of my new lighting scheme. You report: "I had, up to this time, only managed to get about six streets done; and I fancied that I had got ten to fifteen new consumers in that area." What I said was: "I had, up to this time, only managed to get about six streets done; and I fancied that I had got ten to fifteen new consumers in each street.

Montrose, April 14, 1909. A. MACKAY.

Iron Carbonyl in Coal Gas.

SIR,—In my communication about iron carbonyl in coal gas, in the last number of the "JOURNAL," is a mistake—made by myself.

In the following sentence: "On this being examined, no iron was discovered in the solution," the word "no" must be removed, because I have found iron in the solution.

Will you be so kind to make the needful correction?

Laboratory, Eastern Gas-Works, Amsterdam, April 15, 1909. J. N. E. TEUNE, JUN.

LEGAL INTELLIGENCE.

Disputed Gas Consumption at Forfar.

Last Thursday, Sheriff-Substitute Lee gave his decision in an action which has been before him for some time, in which the Town Council of Forfar sued Mr. James Nicoll for £2 2s. 4d. for gas consumed in the quarter ending April 6, 1908. Evidence was given by Mr. J. Baxter, the Gas Manager, to the effect that when the account was rendered, the defender complained of the amount being too large. He sent a man to examine the meter, and he reported that the reading was right. Subsequently the meter was taken to the gas-works, and was tested and found to be correct. In the witness-box, the defender said his normal gas account was less than 10s. per quarter. He was sure that during the period in dispute gas was not extravagantly used. He had offered to pay half of the account; but this was not accepted. The Sheriff gave decree for the sum sued for. He said he thought an examination of the figures might result in the discovery of some mistake which would furnish a reason for the really extraordinary account which the defender had been called upon to pay; but it had not thrown any light on the matter. It was certainly a hard case on the defender, because nobody who heard the evidence could have any doubt that something had gone wrong, and that there must be something other than the defender's ordinary consumption of gas to account for the progress of the meter during the quarter in question. The pursuers were entitled to make out their accounts by the indices of the meters. If the defender had been watching, he must have seen how the meter was going, and he could then have had it tested if he found it wrong, and he would have had an absolutely good defence. But he did not do this, and trusted his meter, with which the pursuers said they found nothing wrong. He was sure the defender had been the victim of a mistake somewhere; but he would have to pay for it, as it was a mistake he had the opportunity of finding out.

Private Supply of Water from the Thames.

At the Tower Bridge Police Court, last Thursday, Messrs. Van Lessen, Son, and Barker, wharfingers, &c., of Rotherhithe Street, S.E., were summoned by the Bermondsey Borough Council for not having a proper and sufficient water supply. It appeared that originally the defendants paid a water-rate of £2 2s.; but under the new law the Metropolitan Water Board charged them 5 per cent. on their rateable value of £165. They had three men only in their employ; and they considered the charge so excessive that they decided to dispense with the Board's supply. They utilized the tank and pipes, and flushed the lavatories with a regular supply of water taken direct from the Thames. Having cut off their supply, the Board sent the usual notice to the Bermondsey Borough Council, and the premises were visited by a sanitary inspector. It was not disputed that the lavatories had sufficient water for flushing them; but the Council contended that the defendants should have a proper supply for drinking purposes. They thereupon installed a filter to purify the water; but the Council urged that this was not sufficient. Mr. Ashby, the Manager, said he did not think he had seen any of the men drink water. The foreman was an abstainer, and went home to his meals; and the other two drank beer. Pure water was supplied through the filter if it was required. Mr. Rose said that, under the circumstances, he would be straining the Act of Parliament if he were to hold that there was not a "proper and sufficient water supply;" and the summons would therefore be dismissed.

Illuminating Power of Hornsey Gas.—At the last meeting of the Hornsey Borough Council, it was reported that a recent test of the gas supplied by the Hornsey Gas Company showed that the mean illuminating power (corrected) was 17·26 candles; the statutory power being 15 candles. Referring to the matter, the "Hornsey Journal" said: "This, we believe, is unequalled in the history of the Company. The minimum permitted to them is a 15-candle illuminating power, and hitherto they have conscientiously and rigorously adhered to this figure. They are to be congratulated on the improvement; and the consumers will hope that it may continue. Adequate illumination is one of the material comforts of the home; and, therefore, small as such a detail may at first sight appear, it is of considerable importance in the economy of the household and of the community."

MISCELLANEOUS NEWS.

GAS-WORKS SIDINGS AND RAILWAY RATES.

RAILWAY AND CANAL COMMISSION.

(*Before Mr. Justice* A. T. LAWRENCE, *the Hon.* A. E. GATHORNE-HARDY, *and Sir* JAMES WOODHOUSE.)

Corporation of Birmingham v. Midland Railway Company, London and North-Western Railway Company, and Great Western Railway Company.

Second Day.—Tuesday, March 23.

This was a case in which the Corporation of Birmingham, who have constructed extensive private sidings at their Saltley, Nechells, Windsor Street, and Swan Village Gas-Works, asked for an order declaring them entitled to an allowance or rebate on charges made by the Midland, London and North-Western, and Great Western Railway Companies on inward and outward traffic to the various works. They also asked for a declaration that the London and North-Western Company had exceeded their maximum charge for the use of trucks. Further, they claimed damages in respect of the past six years' overcharges. The first day's proceedings were reported last week, p. 105.

The following were the Counsel engaged: For the Corporation: Mr. BALFOUR BROWNE, K.C., Mr. J. A. FOOTE, K.C., Mr. A. H. M'CARDIE, and Mr. J. B. WORTHINGTON (instructed by Messrs. Sharpe, Pritchard, and Co., Agents for Mr. E. V. Hiley, Town Clerk of Birmingham). For the Midland Railway Company: Sir ALFRED CRIPPS, K.C., and Mr. L. MACASSEY (instructed by Messrs. Beale and Co.). For the London and North-Western Railway Company: Sir ALFRED CRIPPS, K.C., Mr. J. A. SIMON, K.C., M.P., and Mr. J. B. ASPINALL (instructed by Mr. C. de J. Andrewes). For the Great Western Railway Company: Sir ALFRED CRIPPS, K.C., Mr. J. A. SIMON, K.C., M.P., and Mr. HAROLD RUSSELL (instructed by Mr. R. R. Nelson).

Mr. G. Hampton Barber's Evidence.

Mr. *G. Hampton Barber*, examined by Mr. FOOTE, said he was Secretary of the Birmingham Corporation Gas Department, who had carried on the works since 1875. The average tonnage of coal delivered to the four gas-works in question was about 550,000 tons per annum. The total quantity of coal purchased on the average of the last three years was 588,000 tons, which included Adderley Street, with which the present case was not concerned. There would be an average of about 1800 tons per working day for the four works. There was also an inward traffic of lime and chemicals and other material used at the four works of some 50,000 tons a year. With regard to the outward traffic, which was mainly coke, from the works in question, this was approximately 100,000 tons a year, or 300 tons a day. He first brought the matter of the rates charged by the Railway Companies to the notice of his Committee in November, 1905; and the following month he gave the Companies notice that the rates were paid from that date under protest, and without prejudice to any claim that might be made for the recovery of excessive charges or for damages for undue preference in freights given by the Companies to firms or undertakings who had thereby been enabled to compete unduly with, and to the detriment of, the Corporation. He had at that time no actual knowledge, but merely suspected that the charges were excessive. The rule with regard to coal was to take 60 per cent. of the purchased quantities for delivery during the six winter months, and 40 per cent. during the six summer months. Subject to these proportions, the contracts were for equal weekly deliveries.

THE MIDLAND RAILWAY CASE.

Mr. FOOTE: The Saltley works are served only by the Midland Railway, I think?

Witness: That is so. Continuing, he said Lawley Street, the nearest Midland goods station, was a mile further from the collieries; and the rates from the different collieries were identical, whether they were to the gas-works siding at Saltley or to Lawley Street Station. The works covered 18 acres; and last year 216,000 tons of coal were taken there. There were 2 miles of sidings within the works.

Mr. FOOTE said an agreement was in operation between the Company and the Corporation, by which the Company were to keep in repair the sidings connecting the railway system with the works, and the Corporation were to maintain the sidings in their own line. The Corporation were to pay the Company for the work they did in maintaining the sidings. Another clause provided that all waggons loaded or placed upon the Corporation sidings for transit over the lines of the Company should be marshalled in accordance with the directions of the Company.

Examination continued: The Corporation had four locomotives to take the trucks in and out of the gas-works. The Company's locomotives came just to the boundary of the works. The Corporation had never experienced any difficulty in dealing with the amount of coal which was ready to be delivered; and he had never received any complaint from the Company as to delay in the reception of trucks. There were large sidings at Washwood Heath; and coal was sometimes detained there before being sent on. This, however, was neither for the convenience nor at the request of the Corporation. So far as he knew, all traffic going to Birmingham and district was received at Washwood Heath sidings and dealt with in a similar manner. As a rule their coal arrived at Washwood Heath sidings in full train-loads. It did not always come in full train-loads from the colliery; but in that case the trains were made up at certain centres by the Company. As a rule, the Corporation did not want the coal in a different order from that in which it arrived at the sidings. About once a month, however, they asked the Company to divert half-a-dozen trucks to the experimental plant at Nechells.

Justice LAWRENCE: The train is all for you when it arrives at Washwood Heath sidings?

Witness: I should say so, as a rule.

Then why does it not come straight on to you?—Because their goods line is frequently blocked, and they cannot get the traffic through.

Mr. FOOTE drew attention to a number of tables to show that there was no delay by the Corporation in taking the coal, and that the Company took longer to deliver to other traders than to them; to show that the capacity of the Corporation sidings was amply sufficient to accommodate the daily requirements of coal; and to show that the station charge at Lawley Street for coke was 3d., from which he argued inferentially that the charge for coal was the same.

Sir ALFRED CRIPPS pointed out that on most of these matters the witness could only speak as to what he had learnt from hearsay. The sole question was whether, as regarded particular sidings or a particular trader, the Company had to perform services and provide accommodation for which they could properly make a charge outside the charge in the conveyance rate.

In further examination, witness said that the services rendered at Nechells were different from those at Saltley. The Company did not deliver the coal to them there; nor did they take delivery of the traffic outwards. The Company put the coal first into Duddeston Mill sidings, which were not devoted solely to the Corporation. Then they drew from twelve to fifteen trucks at a time and backed them on to another short siding, which was not reserved wholly to the Corporation, though in practice it was not used for other traffic. The Corporation locomotive crossed to this siding and drew the waggons into the gas-works. These were the services, at any rate, for what they were worth. As to spent lime, he had had it carted from Adderley Street to Lawley Street Station and loaded up there; and the Company charged the same rate from Saltley or Nechells as they did from Lawley Street.

Mr. FOOTE: I think it is common ground between us now that the Company purport to make a charge of 1d. per ton for whatever they do at the siding in picking up coke?

Sir ALFRED CRIPPS: That is right.

Mr. FOOTE: And our contention will be that this is too much—that they do not do anything. (To witness:) I want to take you now to a separate matter, which is the charge made by the Midland Railway and the Great Western Railway jointly for coke from Saltley to Small Heath. Prior to 1907, were they charging you 1s. 6d. per ton for that conveyance?

Witness: Yes.

Sir ALFRED CRIPPS: There is no difference between us that we charged 1s. 6d.; and when the matter was brought to our notice, we put it down to 1s. 4d. We cannot justify the 1s. 6d. Whether or not that means damages here, is a legal point which we shall have to discuss; but we admit the matter.

Mr. FOOTE: Since then they have reduced the charge to 1s. 3d. That 1s. 3d. must also include 1d. beyond conveyance for services rendered at Saltley.

Witness: Yes.

Mr. FOOTE: That 1d. we are fighting about. Your Lordship will find that this 1d. applies to all the Companies; and speaking without the figures before me, I think all the three Companies have reduced it in the same way. They all leave this 1d. to be fought about.

THE LONDON AND NORTH-WESTERN RAILWAY CASE.

Mr. FOOTE: The London and North-Western run into Windsor Street and Nechells?

Witness replied that they did. The Company allowed them a rebate of 3d. per ton off the Windsor Street Station rate for coal into both these gas-works; but they did not make this allowance for other traffic that came in—lime, for instance. The rates in certain cases contained a "carted and delivered charge," upon traffic sent over the private sidings to the works—which was not carted or delivered, and which did not use the station. In these instances, they would claim a larger rebate than the mere station charge. In Class C there was a station terminal charge of 1s. 6d. included; and there was probably a cartage charge of 1s. to 1s. 2d. per ton—that was, about 2s. 6d. or 2s. 8d. per ton overcharge.

Mr. FOOTE: The question of coke really comes to the same thing with the North-Western as it did with the other Company, which results in a charge of 1d. for doing what they do to the coke at the gas-works sidings. I do not say "collecting," because I do not consider they collect it, but for taking it and accepting it. Your Lordship notices it has come down to 1d. These Companies were obviously overcharging us in various degrees; and the result of this litigation is that they have all come to the conclusion to charge 1d. for services on coke traffic rendered at the Corporation's sidings. Then there is a complaint about the charge for the use of trucks.

Sir ALFRED CRIPPS: It is a pure point of construction. There is no dispute between us as regards the facts.

THE GREAT WESTERN RAILWAY CASE.

Mr. FOOTE: The Great Western is the only Company that has access to Swan Village. There is a Swan Village goods station, is there not?

Witness replied that there was, and it adjoined the gas-works. They paid the same rates as to the station. For station terminal only there was a charge of 6d. per ton on Class B, 1s. per ton on Class C, and 1s. 6d. per ton on Classes 1 and 2. These were the maximum charges.

Mr. FOOTE: It may be the Companies will say they are charging less than the maximum for these distances.

Witness: It may be in the case of the Midland that they say they are charging 1d. on a 66 per cent. rate.

Justice LAWRENCE: I do not know what you mean by a 66 per cent. rate.

Witness: Our coal rates from Derbyshire to Saltley and Nechells are 66 per cent. of their maximum powers. Under the Pidcock rule, we should be allowed 66 per cent. of the maximum station terminal charge at Lawley Street Station. That is 66 per cent. of the 3d., or, in other words, the allowance to us for station terminal on coal traffic to Saltley and to Nechells in respect that no station is provided, should be 2d. per ton, and not 1d. per ton, as they assess.

Mr. FOOTE: 66 per cent. meant that, in fact, the average charge for coal from the Derbyshire Collieries to these sidings is 66 per cent. of the maximum. Therefore, if you apply Pidcock's rule to find what they are charging, you ought to take 66 per cent. of the maximum of each individual charge. If I may say so, without arguing it now, our position is that, with regard to "Coal in," we have given evidence to show that, in fact, they charge for the station terminal 3d. Therefore it is not a question of 66 per cent. upon that, but upon the whole of it. If they actually charge 3d., it is not a question of taking 66 per cent. If you show that they have charged 3d., as we have attempted to do by showing that they charge it for coal, and for Class A, then we say we are entitled to the whole of it. In other words, 66 per cent. is an alternative against us. If we prove that any Company make a station terminal charge of 3d. a ton on traffic taken to their station, then the rebate we have to get upon it is the whole of the 3d.; and really there is no necessity for applying Pidcock's rule at all, nor could it be applied. (To Witness:) Do you remember sending a truck of coal from King's Heath to the Midland Company at Lawley Street?

Witness: Yes; I bought a truck of coal at King's Heath from a merchant of Birmingham, and I had it consigned to Lawley Street Station in that merchant's name. I was charged 1s. a ton for the conveyance of the coal. Dissecting this charge, and allowing the maximum for conveyance, they charge 3d. per ton station terminal at King's Heath, and 3d. per ton station terminal at Lawley Street.

Examination continued: The Great Western Company brought the coal to the boundary of the Swan Village works; and Corporation locomotives dealt with it from that point. There was no siding belonging to the Railway Company at Swan Village (as there was said to be in some of the other cases) which was devoted in any sense to the Corporation's sole use. Certain of the traffic was taken a considerable distance to the canal basin before it was run either into the Swan Village Station or the gas-works sidings. This was on account of the large passenger service; and, of course, it was common to all the traffic, not only that to the gas-works. The gas-works sidings were laid down under an agreement with the Company, who did the work at the cost of the Corporation. The Company had a right to call on the Corporation to lay down additional sidings, should the traffic necessitate it; and they had done so, as a matter of fact. There was a table showing the charge for coal conveyed to Wolverhampton Station and to the Wolverhampton gas-works siding.

Sir ALFRED CRIPPS: What have we to do with the charge we make at Wolverhampton? I do not see how it can be relevant.

Mr. FOOTE: In this way. We want to get at how much is included in the charge made by the Great Western at Swan Village Station for the use of the station. We are entitled to that amount as rebate, whatever it may be, inasmuch as they charge the same with regard to Wolverhampton. What we want to show is that they make a charge for the station there; and when they have the same goods carried to the siding close by, they make a deduction of 3d. In other words, the charge for the use of Wolverhampton Station for coal is 3d. a ton. It is the nearest thing we can get to show what is the proper charge for the use of Swan Village. The coal is the same; and though the stations are not identically the same, they are of the same class.

Justice LAWRENCE: You could only do that in cross-examination; it is not evidence-in-chief.

Mr. FOOTE: If your Lordship says that, I will go no further. There is only one other matter on the Great Western; and that is coke outwards. The Company put in an amended answer on Dec. 18, in which they said: "Since the application was filed, the defendants have revised certain of the rates for coke from the applicants' Swan Village gas-works siding, and have reduced the rates in the manner and to the extent shown in the schedule. The defendants are willing that the applicants' accounts should be adjusted as from the date of the application." The schedule is a long one. Your Lordship will see they are material reductions—from 1d. to 3d., and in one remarkable case—Stroud—11d. We have not touched on what is a very important point in this matter, which must not be lost sight of. The Company say they are willing to consent to an account as from the date of the application; but, of course, we shall claim an account as from the date of six years, on the ground that we commenced our proceedings within a year after we discovered these facts. On the back of the schedule there are some revised rates. Those are the stations on the London and North-Western where the transit commences at Swan Village, and is therefore on the Great Western. There are similar reductions of 4d., 3d., and 6d. There are three instances on the Midland. I was under the impression that in this amended answer it was claimed that they were entitled to charge 1d. per ton for taking coke out of Swan Village siding.

Sir ALFRED CRIPPS: For services in connection with it. You are right.

Examination resumed: In taking coke from Saltley to Small Heath, they started over the Midland; and at Bordsley Junction they got on to the Great Western. Prior to May, 1907, they were charged 1s. 6d. a ton; and this was reduced to 1s. 4d. after the application, and subsequently to 1s. 3d.

Mr. FOOTE: That includes 1d. for services at the sidings. The maximum is 1s. 2d.

Sir ALFRED CRIPPS: In all these cases my friend may take it we claim to make a charge in connection with services at the siding. In most cases 1d., but not in all cases.

Mr. FOOTE: Now as to Corngreave Sidings. In order to get from Corngreave to Saltley you pass through Bordsley Junction. The Great Western made a rate which was 3s. 3d.—3s. 2d., *plus* 1d. That is the rate which we know has been reduced to 2s. 6d. What are the maximum charges according to distance?

Witness: The distance from Corngreave sidings to Bordsley Junction is 11¾ miles. The maximum conveyance charge according to the Act is 1s. 5d. The distance from Bordsley to Saltley on the Midland is 1¾ miles. The maximum charge is 1·25d. per mile; but they can charge for 6 miles, as there is no station terminal in it. Thus the maximum charge is 7½d.

Mr. FOOTE: I will add these two together—1s. 5d. and 7½d. make 2s. 0½d., as against 2s. 6d.

Cross-Examination of Mr. Hampton Barber.

Sir ALFRED CRIPPS, in cross-examination: Just this little outstanding point before I go back to the Midland case. The Corngreave sidings traffic is carried, is it not, in the opposite direction to what you are, down to Stourbridge Junction? Do not you know that what the Railway Company originally claimed to do was to charge in respect of the distance that they were bound to carry this traffic, first of all to Stourbridge, then back to Bordsley Junction, and from Bordsley Junction to Saltley?

Witness: No. It was mentioned to me very incidentally by a representative of the Company within the past fortnight.

THE MIDLAND RAILWAY CASE.

Witness, in cross-examination by Sir ALFRED CRIPPS, said it was only when they were short of coal at Saltley that they whistled from the gas-works for a Midland engine to bring trucks from the special siding to the works. At other times the Company did it at their convenience. The service was performed with an engine that was kept at Duddeston Mill sidings for shunting purposes. As to the Nechells works, none of the Duddeston Mill group of sidings were reserved solely for the gas-works traffic. So far from the Midland Company having gone to large additional expenditure since 1896, in connection with the working of the Corporation and other traffic, he should think they had saved money by the new arrangements—the Washwood Heath sidings. The services rendered by the Company to the Corporation now must be much less costly than they were in 1896.

Sir ALFRED CRIPPS: It has not been any part of your duty, nor have you sought, to ascertain the cost other than in connection with conveyance which the Company are incurring in connection with your Nechells goods sidings or your Saltley station?

Witness: No; I do not know the actual expense that is incurred in giving delivery of our traffic. But I know from the manner in which the Companies deliver it that it must really be very expensive and very extravagant.

Sir ALFRED CRIPPS: From my point of view, we only have to see on the evidence, when it is all before the Court, whether we justify the charge we are making as regards services and accommodation—I mean the cost of services and accommodation which would not be included in the conveyance charge.

Further cross-examined: A fortnight ago they had over 300 trucks on the Nechells sidings, without interfering with the running lines. At Saltley, without counting the reception sidings, they could on their branch lines accommodate 100 trucks without interfering with their running lines. He had no knowledge that special portions of the Washwood Heath sidings were set apart exclusively for the Corporation; but he understood it was so. Certainly such provision had not been made at the Corporation's request. Outward traffic from Nechells and Saltley found its way to the Duddeston Mill sidings. The Corporation owned several hundred waggons; and about one-third of the traffic came in these. He had written to the Midland Company to complain of the coke rate to Nottingham. The Company were bringing coke from Nottingham to Birmingham at a charge of 3s. 1d. per ton. This coke was interfering with the Birmingham trade. He then asked the Company to quote him a rate for coke from Birmingham to Nottingham; and they quoted him a rate of 4s. 10d. Before the present application was filed, he had never complained to the Company that they were overcharging the Corporation as regarded coke rates generally. He only entered into service with the Corporation in 1901; and it took him several years to get hold of the business. In turn he took up this question of railway rates; and as soon as he did so, he dealt with it. No specific written complaint had, he thought, been made in the matter to the other two Companies concerned; but he had mentioned it to their representative.

THE LONDON AND NORTH-WESTERN RAILWAY CASE.

Sir ALFRED CRIPPS: As regards the traffic going into the Windsor Street gas-works sidings, is it, in fact, put first of all into the Windsor Street Station sidings? I am asking as regards miscellaneous inwards traffic other than coal?

Witness: It would be mixed, in all probability, with the traffic of other traders in a train; and when it arrives at the station, you would have to divide the train up. You would have to do that on your siding; and when you have the train divided up, you would draw it out and put it on to our works.

Sir ALFRED CRIPPS: Do you know that this was one of the terms of the agreement when the sidings were put in at the Nechells gas-works; the date being 1899: "The Company shall charge in respect of all traffic to or from the said gas-works and premises rates calculated on the same principle as the rates from time to time charged and paid by the Corporation in respect of traffic to and from the gas-works of the Corporation situated at Windsor Street, Birmingham." At the present time, they are charging you, are they not, at Nechells the same rates for traffic of every kind as they do at the Windsor Street gas-works sidings?

Mr. BALFOUR BROWNE: That is not the meaning of what you just read. It is "calculated on the same principle as the rates," not to be the same rates.

Witness: Yes; but on many of the journeys the distance to Nechells is 40 chains less than to Windsor Street works, so that, in fact, you may in certain cases be charging over the maximum under the agreement; and that would be illegal.

Sir ALFRED CRIPPS: Whether the traffic is dealt with at one or the other, the same charges have, in fact, been made?

Witness: Yes; on traffic outwards, and on traffic inwards other than coal. Now you are giving us a further reduction of 3d. per ton on coal into Nechells. You are bringing it into line with the charge of the Midland Company to Saltley.

Sir ALFRED CRIPPS: You are not complaining of that?

Mr. BALFOUR BROWNE: We had not got it at the time of the application.

Sir ALFRED CRIPPS: Is it any the worse for that?

Mr. BALFOUR BROWNE: No; but we were cheated all that time.

Third Day.—Wednesday, March 24.

Mr. G. Hampton Barber Further Cross-Examined.

THE GREAT WESTERN COMPANY'S CASE.

Mr. SIMON: The Swan Village siding was arranged for and made as long ago as 1874? Then there was an extension, I think, in 1892?

Witness said it was just about doubled. The connection between the siding at the gas-works and the running line was a connection with the up-line. It was laid down by the Great Western Company at the expense of the Gas Company of those days.

Mr. SIMON: If a truck of gas coal is consigned to be delivered at the Corporation gas-works sidings from the south—coming from the direction of London—it would come along on the down-line, and therefore cannot run directly into the gas-works. That is the reason why it, in fact, is run along the branch as far as the Swan Village Basin Station, and there it is shunted back.

Justice LAWRENCE: Does the coal spoken of in the application—Yorkshire, Nottinghamshire, and Derbyshire coal—come from that direction?

Witness: At the time the Company made their answer, it was not so. The whole of it came in the other direction from Wednesbury.

Does the Yorkshire, Nottinghamshire, and Derbyshire coal come from that direction?—Yes; from Birmingham.

Now what do you want to say about some other coal?—At the time the answer of the Company was filed, the whole of the coal, I think, coming into the works was from the contrary direction, so that it came on to the line where it could have been easily backed into our works. It came at that time from North Wales and from the Aldridge Colliery Company.

Re-examination by Mr. Balfour Browne.

Witness, in re-examination by Mr. BALFOUR BROWNE, said the station terminal charge on high-class articles was very much higher than the 3d. terminal on coals. Class B was 6d., class C 1s., and classes 1, 2, 3, 4, and 5 were 1s. 6d. a ton for station terminal. Their complaint had always been that, where services were performed for the station rate, and were not performed for the Corporation, they should have a rebate. In cases where the charge made was a "carted and delivered" rate, they claimed to have a rebate in respect of cartage (which was not done for them), as well as in regard to station terminal.

Mr. SIMON: Let it be taken that, there being a cartage charge, this has got to come out. Whatever the cartage rebate is, without any kind of refinement, we subtract; and there is an end to it. We do not want to waste any time over it. There are, of course, cartage rebates which are agreed. It is the commonest thing in the world to give a cartage rebate off a "carted and delivered" rate. We will give the Corporation that ordinary conventional cartage rebate which we give to everybody; and we would have given it before, if we had only known.

Mr. BALFOUR BROWNE: Of course, with regard to that, it will have to be for six years, because it has only been discovered since the application.

Witness, answering further questions, said, with reference to Swan Village, that the traffic of the public was dealt with in precisely the same way as that of the Corporation. The siding was the Railway Company's own planning, and their own work. As to the Saltley works, the Corporation had never requested the Company to reserve two of the Washwood Heath sidings for them. It did not matter at all to them on which of the sidings their traffic stood. In fact, they did not want the traffic to stand there at all. They wanted it at the works.

Justice LAWRENCE: That is a very broad way of putting it. It is, if the works can take it in at the moment.

Mr. BALFOUR BROWNE: As I understand, your idea in ordering coals is not to glut their sidings, but merely to keep your works going? You would be very silly to order coals that you could not take in; and as a rule you can take in everything that comes.

Witness: Yes; and our consumption is regular day by day throughout the year.

Justice LAWRENCE: He does not order coal forward as and when he has got room in his works. He gives a general order, and it comes away from the collieries.

Mr. BALFOUR BROWNE: Of course, he knows how many tons are being used per year; and he has a very large surplus of stored coal in case he should be short. (To Witness:) In case of a block occurring, instead of taking two days upon the journey, I suppose the coal might take a much longer period; and this coal, being upon the line, would be standing somewhere?

Witness: Somewhere between the collieries and Birmingham. I have known coal to be delayed for a week by fog.

It would not be standing there for your convenience at all. It would be merely because it was blocked on the railway?—Yes; that is so.

Is it any convenience to you to have this coal standing on the Washwood Heath sidings?—It is a very great inconvenience; it frequently imposes cost upon us. Having the trucks standing at Washwood Heath may mean our having to pick up coal from stock; and every ton of coal we pick up from stock means a cost of from 6d. to 10d., according to the position in which the coal is.

Is it a fact that the Railway Company never inform the customer where the coal is on the line?—They never advise us when the coal reaches Washwood Heath. They only give us the number of trucks that are standing there; not the total number of trucks they have received for us.

Justice LAWRENCE: Have you ever asked them to advise you?

Witness: I asked them to advise me the number of trucks they had standing at Washwood Heath, so that I could see that the siding was kept clear.

That is what they do advise you?—They only advise me what is standing; not the number that is received there for us. I asked for the number received day by day, so that we could make arrangements for disposing of the traffic. We got returns from them showing the quantity of coal at Washwood Heath; but these failed to tell me the number of trucks that came in there day by day.

Mr. MACASSEY: There must be some mistake, because I have in my

hand copies of the advice notes which have been sent from time to time to the Corporation, showing the number of trucks standing, not merely at Washwood Heath, but at other sidings along the line, all waiting to be delivered at the Corporation works. Witness must be in error in saying that we only told him what trucks were standing.

Witness: Those are not advice notes.

Mr. BALFOUR BROWNE: I am told these are sent to us and delivered about 9 o'clock in the morning, to say how much is on hand.

Justice LAWRENCE: It does not matter when, so long as you get the notice.

Mr. BALFOUR BROWNE: It merely tells us what is in the sidings.

Justice LAWRENCE: What more do you want to know?

Mr. BALFOUR BROWNE: We want to know when it arrives.

Justice LAWRENCE: If you have it daily, how in the world does it matter at what part of the day it arrives?

Mr. BALFOUR BROWNE: We only get that information in the morning as to what is standing on the siding. We never hear of its arrival at all.

Justice LAWRENCE: If you get that in the morning, and you have not taken the coal away, and get another the next morning, you must know that the difference between what you have taken away and those two notices is what arrived on the previous day.

Mr. MACASSEY: Have you ever asked for any other return?

Witness: No.

Mr. BALFOUR BROWNE: How long has this system been in vogue?

Witness: Six to nine months.

After the application?—Yes.

They did not even advise you as to the number of trucks that were upon the sidings at the time the application was filed?—No, I think not; but I cannot say definitely without reference to the papers.

You have submitted a table with the object of showing that you get notice of what the Railway Company have, and clear the trucks out almost immediately?—And not only that, while we received 2218 trucks from them in November, they only advised us of 1401. The same thing was true with regard to December, when they only advised us of 952 trucks out of 2529. There are always three train-loads of coal or more on the road between the collieries and Birmingham. In November, the average number of trucks, for twenty-five working days, despatched from the collieries was 90; and the average taken into our works 88. In December, the figures were 101 per day from the colliery, and 101 received at our works. In January, 93 per day were despatched, and 86 taken in.

Mr. MACASSEY: Do you suggest that this position of things is typical of other periods of the year?

Witness: I took it at the portion of the year when our traffic is heaviest, and when the weather is worst.

Have you not, at our request, given instructions that the coal should be held back at the collieries, owing to your being unable to take it?—In summer time, possibly; not in winter.

Further Evidence for the Corporation.

Mr. *William Massey*, examined by Mr. FOOTE, said he was Accountant to the Birmingham Gas Department, whose service he entered in January, 1906. He had been engaged checking the accounts rendered by the Railway Companies; and he was instructed to visit the depôts of the Companies, and make extracts from their books, so as to ascertain whether suspected overcharges in fact existed. The first extracts he made were dated Feb. 1, 1906. It was by comparing these extracts with the Acts of the several Companies that he found the alleged overcharges which were complained of in the application. He was responsible for two tables. The first was to show what the charge for the use of the Lawley Street Station was in the case of class A traffic. This only affected the Midland Company; and after crediting the Company with the maximum statutory charge for conveyance, it showed approximately 6d. balance for the two terminals. The second table was a disintegration of the Midland Company's rates on coal to Lawley Street Station from several collieries. It was the Company's own disintegration. It showed that they charged for conveyance something like 66 per cent. of the maximum, on the average.

Justice LAWRENCE: What is this on?

Mr. FOOTE: I am endeavouring to show what the Midland Railway Company charge for the use of the Lawley Street Station on coal, because if I raise the presumption that there is a charge, that is an amount which should be cut off. This makes it rather less than 3d.

Mr. BALFOUR BROWNE: The total rate that they charge for coal from Pinxton Colliery to Lawley Street Station is 3s. The Company themselves disintegrated it in this way. They say that for special service on colliery siding they charge 1d., for conveyance 2s. 10d., and for the station terminal at Lawley Street 1d.

Mr. FOOTE: The Company seek to show that they only charge 1d. for the service at Lawley Street Station. The object of the witness's table is to show that this is wrong. It is 2d. at least, if not 3d.

Witness was only briefly cross-examined by Mr. MACASSEY and Mr. SIMON.

Mr. *Frederick J. Bywater*, questioned by Mr. FOOTE, said he was Engineer of the Saltley Gas-Works, where he had been for the last ten years. There had been a tendency to increase the amount of traffic at Saltley during the past few years. The average number of waggons of coal received there was about 77 per day in the winter and about 57 in the summer. The average of the empty coke-waggons coming in was 56 in winter and 33 in summer. As a very general practice the coal went on to the independent siding which was kept for the waggons of the Corporation. He had at times seen other waggons on this siding; but as a rule it was retained for the purposes of the Corporation. This independent siding held about 40 waggons; and from there the coal was backed to the works to two sidings which held some 24 waggons each. On the latter sidings the trucks remained on an average three to four hours. He could not remember it ever happening that the independent siding was full and could not be discharged because the works sidings were full also. There was a third siding used for empties for coal, and loading trucks of coke. Some 50,000 tons of coke per annum went away over the railway lines; but, of course, a lot also went away by boat. It was entirely on the Railway Company's initiative that the coal was placed on the independent siding. The Corporation had a definite quantity of coal coming forward from the collieries every day; and they wanted this coal delivered to them. All that was desired was that the Company should put the coal along the Corporation reception line. Until the last six months, they had had no official knowledge of any kind of the Washwood Heath sidings; and they had no cognizance at all of what was going on up there. He had never received any complaint from the Midland Company as to the glut of traffic at the Washwood Heath sidings; but, on the other hand, often when the coal was at these sidings it was impossible to get it down into the works. Several times the Company had asked him to take coal to accommodate them; and he had invariably done so. He had never made an application for coal to be delivered in any particular order—in fact, it was not in any way necessary to do so; and he had never had to apply to the Company to hold coal back.

Cross-examined by Mr. MACASSEY, witness said he would be able to take a full train-load of coal, if offered by the Railway Company, every three or four hours; but not every hour, or every few minutes. It was only when they were absolutely wanting coal—when there was none whatever on their reception siding—that they whistled to the Company to bring them a supply from the independent siding. He had not given orders about the placing of the coal specially on one of the two reception sidings. They consumed coal regularly day by day. They wanted it regularly, and tried to arrange for it; but the Railway Company did not by any means supply it.

Justice LAWRENCE: The Railway Company would reply that they run engines and trucks day by day; but something or other interferes with them.

Witness: That is what they put Washwood Heath and other sidings down for. They do not put them down for our convenience.

Cross-examination continued: It was in August last, he believed, that the Company began to advise them of the number of trucks standing at Washwood Heath. His foreman shunter had advised him at odd times, when they had been short of coal, of the number of trucks standing at the sidings. There had been no application whatever to him, as the Engineer of the works, to remove coal from Washwood Heath. He had never given instructions to the colliery companies to hold back the coal, on representations by the Midland Company that their sidings were too congested to receive it.

Justice LAWRENCE: Do you seriously say your works are so laid out that you could take all your coal in full train-loads?

Witness: We can take it.

We know something about this matter, you know. Do you suggest that you could in these works take all your coal in full train-loads?—As a general thing we could not conveniently take in forty trucks at a time. What I say, most assuredly, is this—that whenever the Railway Company have asked us to take any quantity up to a full train-load, we have always taken it. If they put in twenty trucks, they say that suits our convenience. It may be that it does; but it also suits theirs, and they have never asked us to do anything different.

Very likely not. They have not treated you so foolishly as to ask you to take it all in in full trains?—If they have, we can do so.

Am I right in taking you to say you could take all your coal in full train-loads provided they did not contain more than twenty-five trucks?—That is so.

Justice LAWRENCE: All I can tell you is you will have to go into this very thoroughly if you are going to satisfy me that you could conduct your works by taking it in in full train-loads. It seems to me impossible. The mere look of your works makes it appear to be so.

Mr. BALFOUR BROWNE: If the train is twenty-five trucks, we certainly could do it.

Justice LAWRENCE: You must have some elasticity in dealing with the interior of works. You cannot do it by having full trains coming. You would have the trains standing outside for half-an-hour while you cleared the place. It is ridiculous to ask the Court to believe such stuff as that.

Mr. BALFOUR BROWNE (to witness): I think, in order that his Lordship may see what our capacity of receiving is, you ought to give the length of your sidings, apart from what we call running lines.

Witness: The total capacity is 3600 yards; and the capacity for storage is about 1400 yards. One hundred waggons available for storage and the seventy-three waggons for the three sidings would occupy 1024 yards out of the total of 3600 yards. That is to say, it will be seen it is only about one-third, or less than one-third, of the total capacity of the sidings.

Mr. *Walter Chaney*, examined by Mr. BALFOUR BROWNE, said he was Engineer-in-Charge at Nechells, which works he had superintended since 1902, prior to which date he was Superintendent at Saltley. The Nechells works, which were built in 1900, were the last constructed by the Corporation. They were connected by sidings with both the Midland and the London and North-Western Railway systems. The coal carbonized at these works (which were capable of development to double their present capacity) had so far never exceeded 141,000 tons per annum. In consequence of the connection with the two railways, the coal was delivered over that on which the lowest rate obtained. They had at times different contracts with North Staffordshire collieries; and as the rate to the Nechells London and North-Western sidings was 2s. 11d., as against 3s. 7d. *vid* the Midland, the former route was naturally chosen. In addition to coal, the inwards traffic per annum included 8000 tons of oil, 5500 tons of lime, 1800 tons of bricks and fire-clay, and 1000 tons miscellaneous. Then Messrs. Brotherton were contractors for ammoniacal liquor, and leased their works from the Corporation. These works adjoined the gas-works; and they used the Corporation siding. Waggons for Messrs. Brotherton equalled 20,700 tons a year. The total in traffic was thus 178,000 tons per annum, 80 per cent. of which was coal. The works sidings had been laid out in modern times, and were arranged to give a very large amount of accommodation. More than the maximum daily requirement in waggons could be accommodated. The whole of the sidings were capable of holding nearly 350 waggons. The method of delivering by the Midland was as a rule to store some traffic in their Duddeston Mill sidings, and then bring it back and push fourteen or fifteen waggons

into a short connecting siding. The Corporation locomotive went over this siding and hauled the traffic in. The Duddeston Mill sidings were general sidings for a great deal of other traffic besides that of the Corporation. It was not a fact that two of these sidings were reserved specially for the Corporation traffic. The average time that waggons were allowed to stand on the small connecting siding was about thirty minutes; and frequently they had cleared it in the space of two or three minutes. This siding was, on the other hand, also used for outgoing traffic; and at times they experienced difficulty in getting the Railway Company to clear it in order to put on incoming traffic. The connecting siding was too limited to allow the Company to put in large quantities of traffic—the capacity being only fifteen trucks. This, of course, meant that a considerable standage must take place upon the Duddeston Mill sidings, and that a considerable amount of extra shunting had to be done. If the Company had a siding that would contain (say) a full train-load, it would be more favourable to them in shunting, and also more favourable to the Corporation in taking the coal. In fact, the shortness of the siding caused additional cost of working and considerable inconvenience resulted to the Corporation and the Company.

Justice LAWRENCE: What point does this bear upon?

Mr. BALFOUR BROWNE: It bears upon the point that the stuff has to stand upon the Duddeston Mill sidings.

The Court then adjourned.

FAREWELL TO A WORKMAN-DIRECTOR.

An interesting retirement and presentation have taken place at the South Suburban Gas Company's works. Mr. R. Wyllie, who with Mr. W. G. Waller enjoyed the distinction of being the first Workmen-Directors of the concern under Sir George Livesey's co-partnership scheme, has—being now 66 years of age—decided to take a well-earned rest. Mr. Wyllie has been in the service of the Company as carpenter and joiner more than half his life, or nearly 36 years; and for three years, in addition to his work as foreman carpenter, he has taken his part in the administrative work in the Board room. It will be a great satisfaction to him in his retirement to know that he filled such a conspicuous position in the co-partnership system of the Company, and enjoyed the honour of working on the same Board as the great founder of the system.

A few days since, officers and men assembled at the works to take their farewell of Mr. Wyllie, and to present him with a tribute and memento of their regard. This took the form of a beautiful gold albert chain and seal. Mr. Waller—Mr. Wyllie's colleague on the Board—presided. He was supported by Mr. G. Ross who has been elected to fill the vacancy caused by Mr. Wyllie's retirement, and Mr. S. Y. Shoubridge (the Company's Engineer and Manager), Mr. John Whimster, Mr. Maltster, Mr. B. P. Bezant, and others.

Mr. WALLER, in making the presentation, remarked that they had met there that afternoon to ask Mr. Wyllie to accept a small present, as a mark of their personal esteem and of appreciation of his services, and as a memento of his long and faithful connection with the Company. It was a painful thing to have to say "Good-bye" to one who had worked with them for so many years. But Mr. Wyllie had a right, after so busy a life, to rest for the remainder of his days; and they all hoped he would enjoy many years of health and happiness. It was absolutely impossible for him (Mr. Waller) to find words to express his admiration for the splendid example of energy, perseverance, and faithfulness to duty as a workman that Mr. Wyllie had set them all, and for the many good qualities he had shown in the various positions he had occupied in the affairs and interests of the Company and the workers. As a Director, he had held the novel position with credit to the workmen he represented, and to the satisfaction of his colleagues, who had parted with him with much regret. Personally, he deeply regretted the parting from one with whom he had had such intimate association, particularly during the past three years; and he was sure that feeling was shared by all present. He sincerely hoped that Mr. Wyllie would enjoy good health and happiness in the years of his retirement. It was with great pleasure he handed the chain and seal to Mr. Wyllie, and hoped the gift would always remind him of the goodwill of those whom he was leaving behind.

Mr. SHOUBRIDGE supplemented Mr. Waller's remarks, testifying to the high esteem in which Mr. Wyllie was ever held by Directors and employees alike.

Mr. WYLLIE, in his acknowledgment, said that an occasion of parting such as this was a difficult one upon which to find adequate words to express one's feelings. He could not do more than thank those with whom he had worked for their gift, which would always represent to his mind a great deal associated with the past and those with whom he had worked in various capacities. He was glad to have this memento of his connection with the works to take away with him; but, without it, he could not but always cherish the pleasant recollections of his long association with the Company and his fellow-workers. To him, however, the occasion was naturally one that caused his heart to be full. Beyond this he could not say more, excepting that he felt sure Mr. Ross, his successor as a Workman-Director, would well fill his place on the Board of the Company. It would be one of the most pleasant remembrances that he himself had enjoyed the confidence of his comrades, and had been elected one of their first Directors.

Mr. ROSS (the newly-elected Workman-Director) took the opportunity of thanking his brother co-partners for having elected him to the place rendered vacant on the Board by the retirement of Mr. Wyllie. He rather fancied his fellow workers had shown more confidence in him than he had in himself. However, he would try his utmost to merit their confidence in the position of honour by doing to the best of his ability the work of the office that had been so ably filled by Mr. Wyllie.

The Directors of the Tarapaca Water-Works Company, Limited, announce a final dividend of 4 per cent., less tax; making, with the interim dividend, 7½ per cent. for the year 1908.

TRANSFERENCE OF MATERIAL TO DUBLIN GAS-WORKS.

Objections by the Dublin Port and Docks Board.

Readers of the "JOURNAL" are aware that the Alliance and Dublin Consumers' Gas Company have in Parliament a Bill to confer further powers upon them. They require, among other things, authority to construct certain specified works with the view of further facilitating the transference of coal and materials from vessels alongside Sir John Rogerson's Quay to the gas-works; and the proposal has been under the consideration of the Port and Docks Board. At a meeting of the Board held last Thursday, under the presidency of Alderman W. F. Cotton, J.P., the Chairman of the Company, the Law and Parliamentary Committee reported that, as the result of conferences which had taken place in London, the Council had sent to the Company a letter from the Port and Docks Board stating that their Engineer could not approve of the plans which had been forwarded to them, as the works shown would form a serious obstruction to the general trade of the port. He was fully satisfied that works giving the facilities required by the Company could be designed which would not be open to this objection. It was added that the Port Act of 1902 gave the Board full power to carry out such works, and they were prepared to exercise it in the present instance. The letter had been approved by the Board; and the Committee submitted for their consideration a resolution on the matter which they suggested should be forwarded to the Company. It was to the effect that if the Company would withdraw from their Bill the paragraph in the preamble with reference to the acquisition of lands and the erection of works and all clauses relating thereto, and would insert a saving clause for the protection of the Board similar to that contained in section 5 of the Alliance and Dublin Gas Act, 1879, the Board would undertake to construct across Sir John Rogerson's Quay such overhead communications and appliances, and under such terms and conditions, as might be agreed upon between the Board and the Company. The resolution was adopted.

GAS-COAL CONTRACTS AT SALFORD.

The Publication of Tenders.

At the last Meeting of the Salford Town Council, the proposal to confirm the contracts for the coal required for the gas-works gave rise to some rather strong remarks. A Special Committee was appointed some months ago to consider the question of the publication in the *agenda* of the amounts of all contracts and the terms of all special trading agreements entered into by the Corporation; and Mr. Royle moved, as an amendment, that the contracts now submitted should be referred back to the Gas Committee until the report of the Special Committee had been received. Mr. Boscoby, in seconding the motion, characterized the Special Committee as a "farcical" one, and said he had been told that one of the firms whose tender had been accepted for the supply of 80,000 tons of coal had quoted prices which were among the highest; and he had heard further that one or two members of the Gas Committee had described the coal as being "rubbish." Alderman Phillips, the Chairman of the Gas Committee, pointed out that, as usual, all information about the contracts was at the command of members of the Council, but not for publication. Referring to the remarks made by certain speakers on this subject, he said he had been a member of the Council for 24 years, and had never before been so disgusted with men who came, presumably as representing the public, and suggesting that his methods were "subterraneous," and made a lot of innuendoes which it was difficult—indeed, almost impossible—to disprove. Unless they wished to have the borough in physical as well as intellectual darkness, the purchase of this coal should not be deferred. He did not often recede in the face of the enemy; but he was certainly not going to stand much longer these constant innuendoes. He would not do it even for the ratepayers of Salford. On being put to the vote, the amendment was defeated by 31 votes to 8, and the contracts were confirmed.

Just previously, when the minutes of the Gas Committee were submitted, Mr. Boscoby moved that certain minutes be read *in extenso*. A heated discussion followed; and finally the Mayor ruled the motion out of order, and the minutes were confirmed.

DEVONPORT CORPORATION GAS-WORKS.

New Governors—Contracts for Stores.

At the last Meeting of the Devonport Town Council, the Gas Committee reported that they had considered a recommendation by the Gas Engineer (Mr. W. P. Tervet) that new governors be provided at a cost, including buildings, mains, &c., of £1900, and had come to the conclusion that the governors should be provided at a cost of £850, and that the erection of the buildings be deferred for the present. The Committee also presented a long list of tenders for stores of various kinds, recommending that some should be accepted, and that where no tender was accepted the firms at present supplying the goods should be authorized to continue to do so at present prices, failing which the Gas Engineer should obtain goods from the lowest on the list of tenderers.

Alderman TOZER, in moving the adoption of the report, said the expenditure on new governors was necessary. Two of those at present in use had been in service for 40 years, two for 23 years, and two for 21 years; and the Gas Engineer had said that unless an improvement was made he could not be responsible for the consequences. The Engineer suggested the erection of a new governor-house; but the Committee thought it advisable to keep the expenditure down to the lowest possible amount, and to provide for the governors only. These were absolutely necessary. Unfortunately, their borrowing powers were exhausted, and the cost would have to come out of revenue. There was, however, some compensation for this abnormal expenditure in the list of tenders which

the Committee had accepted. They found that there had been no contracts for the supply of any of these goods. In the past the practice had been for them to be ordered, and when the accounts came in monthly or quarterly they were paid. Under the head of "Sundries," there were no fewer than 79 different articles; and he found that, on a comparison of the new and old prices, they would save no less than 29 per cent. In oils they would save 28 per cent., in burners 21 per cent., and in mantles 29 per cent. The Committee had not accepted the lowest tender in every case, but had been guided by the advice of the Engineer as to the suitability of the article. Generally speaking, on about 90 per cent. of the articles they were buying they were affecting a saving of from 5 to 50 per cent. in the cost as compared with former prices. The saving of expenditure on these items would more than pay the cost of the new governors.

Mr. DAYMOND asked what would be the saving in money through these contracts, and whether the oils contracted for included oil for the carburetted water-gas plant.

Alderman TOZER said the oil for gas making was a separate contract, but there was a saving also on that.

Mr. COOMBS thought it strange that none of the sixteen members of the Gas Committee had thought of the necessity of having tenders until now. The present Committee were to be congratulated on having taken this action; but those who were on the previous Committee could not escape responsibility. He asked what was to be done in regard to the goods for which no tenders were accepted.

Alderman TOZER replied that he should have preferred to say nothing about these for the present. Messrs. Willey and Co. had been supplying certain of these goods; but, as the Council knew, negotiations had been going on between the Committee and the firm as to another matter, and until these negotiations were concluded it was thought better to leave the other tenders over. There was no reason why the relations between the Committee and Messrs. Willey and Co. should not be as satisfactory as they had been in the past.

Alderman HORNBROOK remarked that, in regard to tenders for many things, the Council must remember that the prices of iron and steel had now been falling gradually for two or three years. This had been a matter of conversation between himself and the former Engineer; and they thought it wiser to wait until the market found its level. There was another consideration. Though they obtained some of these small things cheaper, they would have to pay more heavily for articles the cost of which ran into hundreds of pounds.

The minutes were passed.

CHEAP GAS FOR HEATING AND POWER AT BURSLEM.

At the last Meeting of the Burslem Town Council, a new scale of charges for gas to be used for heating pottery kilns and for motive power was adopted; and it will come into operation in June. Up to 20,000 cubic feet per quarter, the price will be 2s. 6d. per 1000 feet, decreasing by 2d. for larger quantities (1s. 6d. being the figure when the consumption is more than 1½ millions); all subject to 6d. per 1000 cubic feet discount if accounts are paid within a month. At the same meeting, the Gas Committee reported that Messrs. Oliver and Son, of Longport, had applied for a supply of gas for power purposes to a new flint-mill which they intend to erect, and that the Chairman, the Vice-Chairman, and the Gas Manager (Mr. E. Jones) had fully considered the application, and recommended that an agreement be entered into with the firm for the supply of gas for a period of ten years in quantities of not less than 1½ million cubic feet per quarter at the price of 1s. per 1000 cubic feet, subject to an adjustment of the price at the end of the first five years, or at the end of any succeeding year of the term, in case the cost of fuel should exceed 11s. per ton delivered at the gas-works. In the course of the discussion on the matter, it was pointed out, with reference to the new scale, that those taking a million cubic feet of gas would get the whole of it at the cheap rate, though the Staffordshire Potteries Water Company did not supply water on this basis, but charged the earlier part of the supply at the higher rate. Some of the members seemed to think the same principle might be applied to the new scale for gas sold in bulk; but the report was adopted. With respect to the supply to Messrs. Oliver, it was asked if it would pay at the price. In reply, it was admitted that the gas could not be supplied at a profit at the figure named, if the capital charges had to be included; but it was stated that since the Gas Committee had lost the Wolstanton district, the works were greatly in excess of the consumption, and that this circumstance warranted what was being done.

Gas Profits at Southport.—The gross profits of the gas undertaking of the Southport Corporation for the past financial year amounted to £29,277; the income being £88,552, and the expenditure £59,275—the latter including £3000 spent on reconstruction work. After payment of interest on loans and sinking fund charges, there is a net profit of £14,840, compared with £13,417 for the previous year. A sum of £13,000 is to be handed over in relief of the rates, and £520 of the balance is to be expended on fixing Humphrey lamps; leaving £1320 to be carried forward. Coke realized £11,785 last year, compared with £6407 in the preceding twelve months.

Gas and Water Supply in the Dewsbury District.—The Local Government Board have issued a Draft Provisional Order, under which Thornhill, Ravensthorpe, and Soothill Nether are to be included in the borough of Dewsbury, while Soothill Upper is to be divided between Dewsbury and Batley. The Order provides that from and after March 25, 1910, the Dewsbury Corporation are to supply gas to that portion of Soothill Upper which is now added to Dewsbury; the terms of the transfer to be settled by section 62 of the Act of 1888. Protection is given to the Mirfield Gas Company, whose rights and powers are not interfered with. Nothing in the Order is to extend the area within which the Dewsbury Corporation, the Dewsbury and Heckmondwike Water-Works Board, or the Heckmondwike District Council may supply water.

GAS SUPPLY IN SHANGHAI.

We have received the report and accounts of the Shanghai Gas Company, Limited, for the past year, which were presented at the annual general meeting on the 26th ult. We learn from the report that the progress of the Company continues satisfactory. The revenue amounted to 666,719 taels, and the expenditure to 425,526 taels; the profit on the working account amounting to 241,193 taels, which was transferred to the profit and loss account. The net profit for the year was 219,162 taels—a decrease of 29,788 taels as compared with 1907. This result was almost entirely occasioned by the interest incurred on the cost of the recent extensive additions to the Company's plant. The Directors have considered it advisable to write-down considerably the stocks of materials held in certain departments; and to enable them to do this, they have appropriated from renewals and depreciation account the sum of 30,000 taels. The balance at the credit of the profit and loss account, after crediting the account with 6603 taels carried forward and with the 30,000 taels just alluded to, and deducting the interim dividend, at the rate of 7 per cent., paid in July, was 171,766 taels, which the Directors recommended should be appropriated as follows: Final dividend of 6 per cent. (making 13 per cent. for the year), 72,000 taels; amount written off for depreciation of land and buildings, plant, and furniture, 95,459 taels; carried forward, 4306 taels. The private consumption of gas increased 25,939,900 cubic feet, or at the rate of 5·77 per cent.; the increase in the gas consumed for public lighting being 658,238 cubic feet, or 4·17 per cent. The number of gas-engines in use is now 113; while the augmentation in the quantity of gas employed for power last year was 3,127,400 cubic feet, or 6·21 per cent. There were 2829 tons more coal carbonized and 36,387,900 cubic feet more gas made last year than in 1907. The market for the Company's residuals was satisfactory; and, apart from coke, of which a largely increased quantity was used for manufacturing purposes, there was a considerable increase in profit on all products. Early in the year, the Directors decided to provide the funds necessary for the payment of the balance of cost of the new plant, by the issue of further loan capital in preference to increasing the share capital. To enable this to be done, it was necessary to consolidate the whole of the debenture issues of the Company; and steps to effect this were taken. It was decided to create a new issue of 6 per cent. debentures of not more than 1,250,000 taels, of which, in the meantime, 400,000 taels should be applied to the redemption of existing issues, and a further amount, not exceeding 400,000 taels, should be issued as required. Practically all the holders of existing debentures have agreed to accept the new debentures in place of those now held by them; and of the residue a considerable portion has already been placed.

Appended to the Directors' report is a summary of that of the Engineer (Mr. H. King Hiller). He states that the condensers, washers, and scrubbers of the new section of the works were completed during the year, and are now in use, thus finishing the scheme of extensions entered upon three years ago, and bringing up the Company's possible output to 3,700,000 cubic feet per day. Filters, storage-tank, and overhead service-tank have been constructed from disused plant to supply the works with filtered water from the Soochow Creek. The following are the figures relating to the working: Coal, &c., carbonized, 44,795 tons; gas made, 531,877,400 cubic feet; yield per ton, 11,870 cubic feet of gas, of an average illuminating power of 15½ candles. With regard to distribution, Mr. Hiller reports that 13,944 yards, or about 8 miles, of new and enlarged mains were laid during the year, and a pressure-raising plant, consisting of a steam-turbine driven fan, was installed to increase the supply to the central and French districts. The quantity of gas sold last year was 488,008,100 cubic feet (an increase of 5·77 per cent.); and used at the works, unaccounted for, and in stock, 43,869,300 cubic feet.

LINCOLN GAS AND WATER SUPPLY.

Gas-Works Profits—Position of the Water Undertaking.

At the last Meeting of the Lincoln City Council, the Gas Committee reported that the existing purifiers at the Bracebridge works had been inspected, and it was resolved that the Manager (Mr. John Carter) should invite tenders for four new purifiers, 30 feet square, each with centre-valve and all necessary connections and fittings. It was also resolved that a sum of £3000 be contributed out of the gas-works revenue in aid of the general district rate for the year commencing April 1, 1909. Alderman Wallis moved the adoption of these recommendations. He said the Committee had taken a forecast of their accounts for the year, and they were quite satisfied that they were able to recommend that £3000 be granted to the rates. With regard to the purifiers, they had been down since 1876, and though they were enlarged in 1885, they were now much too small for requirements, and were also in an unsatisfactory state. The Committee wanted to spend about £4000 during the coming year, on various things, and they thought they would be able to provide for it during the next year or two out of their profits, and also be able to hand over an amount for the rates. The minutes were confirmed.

At the same meeting, the Chairman of the Finance Committee (Mr. C. W. Pennell) presented the estimates of the income and expenditure for the year ended March 31, 1910. Referring to the water undertaking, he said matters were not very satisfactory. A statement had been prepared, but it was only an approximate estimate of expenditure. During the past year, the sum spent on the water-works was £18,030, and their income was £17,204; leaving a deficiency of £826. During the coming year, the expenditure was estimated to be £22,560, and the income, other than by rate, from the supply of water by meter, &c., £7405. There was thus a balance of £15,155 to be provided by rate, or £4530 more than last year. The increase was due to interest and repayment of the costs of the Water Act, £1670; and new works, interest, and sinking fund, £2710. They hoped to spend something like £100,000 during the coming year, and the interest and sinking-fund charges would have to be paid. The rate required to raise the £15,155 was

1s. 11½d. in the pound, which was practically 2s. for the city and 3s. for those residing outside. As, however, the Corporation had to levy a differential rate for these, it was only fair that this amount should be charged, as the city had to pay off an enormous deficiency. It was suggested that the Corporation should wait until the new water supply was in the mains before they levied an unearned rate; but this was out of the question, as funds were required for proceeding with the work. They proposed to spend on the new scheme £200,000, which was a very large amount. He trembled to think what would have been the fate of anyone who had happened to suggest such an outlay before the typhoid epidemic; but Lincoln people had demanded a new supply at whatever cost, and he expected they were prepared to pay for it. Next year the sinking-fund charges would be increased by something like £3000; so they had not yet reached the limit of what the water-rate would be. In all probability it would be 2s. 6d. next year, and not until they got the new supply in the mains would there be any possible chance of a reduction. It must necessarily be more costly to run two businesses than one; and when they were able to cut off the old works, the rate would begin to go down. A few years more would see the repayment of the cost of the Boultham bore. The amount was borrowed for ten years only; and the interest and sinking fund amounted to £1670 per annum.

GAS-WORKS EXTENSIONS AT BURTON-ON-TRENT.

At their Monthly Meeting last Wednesday, the Burton-on-Trent Town Council adopted various recommendations of the Gas Committee in respect to the carrying out of new works in connection with the gas undertaking.

The scheme embraces the diversion of the railway sidings and the raising of the boundary wall of the works. Messrs. Clayton, Son, and Co., of Hunslet (whose tender amounted to £8077), are to erect a four-lift gasholder and steel tank, with external guide-framing consisting of fourteen latticed standards, three tiers of latticed girders, and three tiers of bracing-rods or wind-ties. The tank is to be 125 feet diameter by 26 feet deep; and the four lifts are to be 122 ft. 6 in., 120 ft. 3 in., 118 feet, and 115 ft. 9 in. diameter respectively, by 25 feet deep—the inner lift rising above the guide-framing. The total capacity will be 1,038,000 cubic feet. About 7 feet of the tank will be underground; and the tank will be placed on a concrete foundation, to be prepared by Mr. George Hodges, a local contractor. The Council also accepted the tender of Messrs. Vale and Sons, of Stourport, for the erection of nine Klönne regenerator settings in the No. 5 retort-house.

A local paper commenting on the matter says: "The tenders accepted yesterday represent a sum equal to 9d. or 10d. in the pound on the rates; but the ratepayers need not quake. The money is already provided through the wise policy of building up a substantial gas reserve account in the past few years. Indeed, it is hoped that the whole of the improvements will be met out of the reserve, and then leave a balance in hand."

GAS SUPPLY IN ROTHERHAM OUT-DISTRICTS.

Proposed Inclusion of Thrybergh.

At the Town Hall, Rotherham, last Thursday, Mr. F. J. Willis held an inquiry, on behalf of the Local Government Board, into an application made by the Corporation for a Provisional Order to sanction the extension of their limits of gas supply by the inclusion of the township of Thrybergh, in the rural district of Rotherham. Mr. J. F. Lloyd Mortimer (the Recorder of Rotherham) and Mr. W. J. Board (Town Clerk) represented the Corporation; Mr. T. E. Ellison appeared on behalf of the Dalton Main Collieries, Limited, the largest ratepayers, the Rotherham Rural District Council, and the Lord of the Manor (Mr. J. S. H. Fullerton).

In opening the case, Mr. Mortimer explained that the Corporation had power to include the hamlet of Dalton within their area for the supply of gas, and last year the mains were taken there. Dalton had grown from quite a village to a populous place, and at the present time 350 houses were being supplied with gas by the Corporation. They had laid an 8-inch main; and in the event of the present application being granted, no alteration would be necessary. Thrybergh was not in the Corporation area, but it had a large population, and there was no gas supply. So far as the public authorities were concerned, a clause for their protection had been agreed upon, chiefly in regard to the roads. Correspondence had taken place between the Corporation and the Rural District Council; but there was nothing to throw any light upon the Council's actions, and the opposition had come as a surprise. The action of the Thrybergh Parish Council until the previous Tuesday had been uncertain; but on that day they had decided to support the application. With regard to the inhabitants, 313 out of 350 householders had signed applications in favour of gas being supplied by the Corporation. Thrybergh was at present lighted with oil-lamps and candles. There was no doubt that, owing to the energies of the Colliery Company, the place had grown. The Company had built most of the houses, and had entered into an arrangement to light the streets with electricity; and for this purpose some poles had already been put up. He was not aware whether the Company were proposing to light the houses by electricity or by gas if the present application failed. If they purposed doing it by gas, there was no doubt it could be procured from the coke-ovens at the colliery; but, on the other hand, the Corporation were in a far better position, having their mains laid right up to the borders of the parish, and were therefore better able to deal with the matter than the Company.

Evidence was then given by Alderman Gummer, the Chairman of the Gas Committee of the Corporation, in support of the application. In the course of it, he stated that the rate charged for gas at Thrybergh would be the same as at Rotherham. In cross-examination, he acknowledged that the application of the Corporation was made as a mere commercial speculation. After paying expenses, the revenue of the gas undertaking was available, and had been used, for the relief of the borough rates.

Among the other witnesses called was Mr. J. E. Knight, the architect of the new church at Whinney Hill, who said the Colliery Company had been approached with regard to the lighting of the church, and the information received was to the effect that they would not do it. Rev. G. H. C. Bowen (the Rector of Thrybergh) made an independent statement in favour of the application. In doing so, he asserted that Mr. Fullerton really supported it; his objection being confined to any proposal the Corporation might make for the inclusion of the parish of Thrybergh within the area of the borough. This statement was borne out by Mr. T. Beeden, Mr. Fullerton's agent.

The Town Clerk read a letter from Mr. Vickers Edwards, an architect, in support of the application, and emphasizing the necessity of bringing the gas-mains to the Whinney Hill Schools. He said he considered the lighting of the schools by paraffin lamps dangerous for children. It was not only essential from the point of view of safety, but also in the interests of education, that gas should be provided.

Mr. Ellison, in opposing the application, dealt mainly with the legal aspect of the matter. He argued that the Local Government Board had no power to make the Provisional Order where the question was merely a commercial one. Any profits of the gas undertaking would go to the ratepayers of Rotherham, and not to the consumers of Thrybergh. The Colliery Company, who owned nine-tenths of the houses of Thrybergh, were willing to put down proper gas plant to supply the district, and had prepared the plans and estimates for the purpose.

Mr. James Elce, the Manager of the colliery, said the Company started to get out the plans for the gas-works two months ago; but he had not seen them, and could not give details as to the capacity of the works. They were on the lines of what was done in similar villages in other parts of the country.

Mr. Mortimer submitted that it was clear the inhabitants of Thrybergh wanted gas, and that the Corporation were in the best position to supply it. Even if the Colliery Company had the power to furnish gas under their Articles of Association, they might any day be prevented from doing so by an injunction obtained by a shareholder. The Corporation were willing to supply gas at a cost which would satisfy the parish.

MERCANTILE CORPORATIONS AND THE FRANCHISE.

The Bill to confer the municipal franchise upon mercantile corporations and companies which was introduced last session and dropped, has been brought in again by Sir William Holland, supported by Sir Clifford Cory, Sir Henry Kimber, Mr. Robert Balfour, and Mr. Holden. It provides that where any corporation aggregate or joint-stock or other company is in occupation, as owner or tenant, of any land or tenement of the clear yearly value of not less than £10 in any district or place having a local government register of electors, and is rated in respect of the same, a duly authorized officer shall be entitled to be entered in the register, and to vote at any election excepting for a Member of Parliament, and shall also be qualified to be elected as if he were in all respects fully qualified to be entered and vote and be elected. An officer of a corporation or company authorized to vote is to make his claim on the prescribed form, and forward it to the overseers or the assessors of the parish in which the vote is claimed. The overseers or assessors are to make out a list of all persons so claiming; and, subject to any objection sustained before or revision by a revising barrister, the list is to be incorporated in the next printed burgess roll, and the power to vote is to come into operation on the 1st of November in that year, and continue for twelve months. It is provided that His Majesty the King may, by Order in Council, alter the instructions, precepts, notices, and forms under the Registration of Electors Acts in such manner as appears necessary for carrying into effect the proposed Act, the County Electors Act, 1888, and any other Act for the time being in force amending or affecting these Acts; and the instructions, precepts, notices, and forms specified in any such Order in Council are to be observed and be valid in law, and clerks of the peace and town clerks and other officers are to act accordingly. The words "corporation aggregate" are not to include any municipal corporation, council of a county or metropolitan borough, county council, urban or rural district council, parish council, or board of guardians.

Kimberley Water-Works Company, Limited.—The report of the Directors for the year ended Dec. 31 sets forth that the working account shows a balance of £23,270. After providing for debenture interest and £956 for depreciation, the net profit, including £1772 interest on investments, is £22,486. The Directors propose to write off £6736 from construction, and to pay a dividend of 2½ per cent. for the six months to Dec. 31; making, with the interim dividend, a total of 5 per cent. for the year, absorbing £15,750. The consumption of water for the year was 172,566,600 gallons, compared with 215,972,700 gallons during 1907.

Lighting the St. Leonards Pier.—According to a statement in the "Hastings Observer," the local Manager of the Rinkeries Syndicate (Mr. H. F. Blackwell) is not favourably impressed with the business methods of the Hastings Corporation as suppliers of electric current. He told a representative of the paper that he was going to have about 4000 lamps on the St. Leonards Pier, with large arcs and electric signs, and he had reckoned to pay 2½d. per unit for the current. But the Corporation offered him terms that worked out at a good deal more than this; and, as the result of his negotiations with them, he came to the conclusion that they did not want to meet him in the matter. Consequently, he went to the Gas Company and asked them what they could do for him. He saw Mr. Botley, and the next day received a quotation, with a plain and businesslike statement for lighting the pier—very different from the Corporation, who kept him waiting a week. "The Gas Company seem," he said, "to be able to meet me on every point, and all at the ordinary price of gas, with a certain charge for maintenance, which works out at considerably less than that asked by the Corporation."

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The illuminating power of the gas supplied in Edinburgh and Leith is again a subject of interest, consequent, I presume, upon the Gas Commissioners having exercised the power conferred upon them in their recent Provisional Order, and reduced the candle power. They are authorized to go down as low as 14 candles. Before obtaining the Order they had been supplying over 20 candles. The first indications of a change having been made was the publication of letters to the editors of more than one newspaper—anonymous, of course—in which complaint was made of the poor quality of the gas. One of the editors has, so far, confined the exercise of his public spirit to the publication of only one letter; but he added under it that he had received a number of others complaining of Edinburgh gas. In the letter he published, the writer stated that he had begun to think it was time to call upon an oculist, but that when spending a night in a friend's house in Arbroath he found that there he could read small print with perfect ease, and without the strain he felt in Edinburgh. I need not go further into the statements in the letters, which, as usual, are not of the most enlightened nature. The same remark may almost be made regarding a discussion which took place in the Edinburgh Town Council on Wednesday. Under the new Order, the Municipal Buildings in both Edinburgh and Leith are made official testing-stations. The Corporation of Edinburgh have fitted up a photometer in their City Chambers, and appointed Mr. W. Gordon, the Inspector of Gas-Meters, as Examiner. In Mr. Gordon's report regarding the gas on the 6th inst., the illuminating power was given as 17·18 candles. Mr. W. W. Macfarlane drew attention to the subject, and said he had received numerous complaints as to the low illuminating power. Mr. Balfour thought it was a pity that the Gas Commissioners had been given authority to reduce the illuminating power to 14 candles. Mr. Thomson stated that in some of the houses of the poorer class there was practically no light at all—candles would be better. Lord Provost Gibson explained that the reason given for the change in the standard of the gas was the immense advantage which would be derived from the introduction of incandescent lighting. Mr. Thomson remarked that the fittings in working-class houses were not suitable for the incandescent light. Mr. M'Michael said there were tens of thousands of houses in Edinburgh where they would never have incandescent light fittings. The Council had nobody to blame but themselves in giving power to reduce the standard. The subject was then departed from. In this short discussion, not any of the speakers, with the exception of the Lord Provost, are members of the Gas Commission. Were there no Gas Commissioners present, who could have given the Council some information upon a subject of so much importance to the community?

Six months ago, the Town Council of Kirkcaldy appointed a Committee to consider the advisability of the Council supplying the community with gaslight—the reason given for taking up the subject being that the present supply is insufficient in quantity and inferior in quality, the Gas Company having failed to keep up to the needs of the community. On Monday the Committee reported to the Council unanimously recommending the purchase of the gas undertaking and the appointment of a Committee to consider under which Act the Council should proceed. Mr. Mackinnon moved disapproval. He was not, he said, opposed to the purchase of the gas undertaking, if it could be shown that it would be profitable to the community; but, so far as he could make out, it could not be bought under £140,000, which he considered far too large a sum for the Council to take on. He had arrived at this figure by taking the profits for the past five years, multiplying them by 28, and adding 10 per cent. for compulsory purchase. Interest upon the sum he had mentioned, at 3½ per cent., would exceed by a few pounds the present profits of the Company. Then they would have to provide £3500 a year for the sinking fund; and as they could not interfere with the present conditions of gas supply in the town, they would have to fall back on the rates, which, in the first year, would mean quite 5d. in the pound. It might be seven or eight years before they could get down to 4d. It would, he believed, take 25, or it might be 30, years before the undertaking would be of any benefit to the town. There was no seconder to this motion. Provost R. C. Munro Ferguson, M.P., said the Committee had very fully considered the question, and he did not think that if they put the matter off for another six months they would be any wiser than they were at present. They had no information which would lead them to assume that they would have to pay £140,000 or any other sum for the undertaking. The really important thing was to see that good arbiters should be appointed. The precedent of Dunfermline had had a certain influence with the Committee, because the purchase of the gas-works there had turned out remarkably well; and there was no reason why it should not turn out equally well in Kirkcaldy. Mr. Wright, who originally raised the subject in the Council, formally moved adoption of the Burghs Gas Supply Act. Mr. Mackinnon asked if the motion was legal. [Notice had apparently not been given.] The Town Clerk was of opinion that the motion was not competent, and the subject was delayed. So was the adoption of the recommendation of the Committee.

The proposal of the inhabitants of Crossgates, Fifeshire, to adopt gas lighting, and the question of whether they are to purchase gas from the Corporation of Dunfermline or from the Cowdenbeath Gas Company, though a small matter, has developed locally into a centre of great heat and activity. It was brought up in the Dunfermline Town Council on Monday by Bailie Husband, who complained that the minutes of the Gas Committee did not contain any reference to the negotiations regarding the lighting of Crossgates. Mr. Stewart, the Convener, replied that the question could not be discussed in public, and the matter dropped. Then, on Wednesday evening, a crowded meeting of ratepayers was held at Crossgates, at which Mr. Stewart made a long speech in support of the view that the supply of gas should be taken from Dunfermline; and he was hotly criticized by several speakers who support the Cowdenbeath supply. So far as could be gathered from the proceedings, the purpose in holding the meeting was to obtain an expression of opinion which might influence the District Committee of the County Council who are considering the question of the creation of a special lighting district at Crossgates. There was no motion proposed; so that expression of opinion will not be found in that direction, though it may be in the enthusiasm of the proceedings.

The Hamilton Town Council discussed the subject for a year or two

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 144.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 6	10	Alliance & Dublin 10 p.c.	17¼—18*	..	5 11 1
298,955	10	,,	7	Do. 7 p.c.	12½—12¾*	..	5 9 10
310,000	Stk.	Jan. 14	4	Do. 4 p.c. Deb.	95—100	..	4 0 0
200,000	5	Oct. 29	6½	Bombay, Ltd.	5¾—6	..	5 8 4
40,000	5	,,	6½	Do. New, £4 paid	4¾—4¾	..	5 15 6
50,000	10	Feb. 25	14	Bourne- mouth Gas and Water	10 p.c.	..	28⅝—29½	..	4 14 11
51,810	10	,,	7		B 7 p.c.	..	16¾—17	+¼	4 2 4
53,200	10	,,	6		Pref. 6 p.c.	..	15⅝—16	..	3 15 0
380,000	Stk.	,,	12½	Brentford Consolidated		..	247—250	..	5 0 0
300,000	,,	,,	5½	Do. New		..	187—190	+1	5 0 0
50,000	,,	,,	5	Do. 5 p.c. Pref.		..	122—124	..	4 0 8
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb.		..	101—103	..	3 17 8
220,000	Stk.	Mar. 12	10⅔	Brighton & Hove Orig.		..	210—213	..	5 1 0
246,320	,,	,,	7½	Do. A Ord. Stk.		..	152—155	..	5 0 0
460,000	20	Apl. 16	10	British		..	4⅛—4½*	..	4 14 1
109,000	Stk.	Feb. 25	6	Bromley, Ord. 5 p.c.		..	114—117	..	5 2 7
165,700	,,	,,	4½	Do. do. 3½ p.c.		..	85—87	..	5 3 6
500,000	10	Oct. 15	7	Buenos Ayres (New) Ltd.		..	12¾—13¼	..	5 5 8
250,000	Stk.	Dec. 11	4	Do. 4 p.c. Deb.		..	94—96	..	4 3 4
100,000	10	—	—	Cape Town & Dis., Ltd.		..	4¾—5¼	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.		..	4¾—5¼	..	—
50,000	50	Nov. 3	6	Do. 6 p.c. 1st Mort.		..	48—50	..	6 0 0
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.		..	77—79	..	5 13 11
157,150	Stk.	Feb. 25	5	Chester 5 p.c. Ord.		..	109—111	..	4 10 1
1,493,280	Stk.	Mar. 12	5⅝	Commercial 4 p.c. Stk.		..	106—109	+½	4 15 5
560,000	,,	,,	5	Do. 3½ p.c. do.		..	101—103	..	4 17 1
475,000	,,	Dec. 11	3	Do. 3 p.c. Deb. Stk.		..	81—83	..	3 12 3
800,000	Stk.	,,	6½	Continental Union, Ltd.		..	101—103	..	6 6 3
200,000	,,	,,	7	Do. 7 p.c. Pref.		..	138—141	..	4 19 3
492,200	Stk.	—	5	Derby Con. Stk.		..	121—123	..	4 1 4
55,000	,,	—	4	Do. Deb. Stk.		..	103—105	..	3 16 2
143,995	,,	Mar. 31	5	East Hull 5 p.c. Ord.		..	96—98	..	5 2 0
486,090	10	Jan. 28	12	European, Ltd.		..	23½—24½	..	4 19 0
354,300	10	,,	12	Do. £7 10s. paid.		..	17⅝—18¼	..	4 18 5
15,161,545	Stk.	Feb. 11	4/10/8	Gas light and Coke	4 p.c. Ord.	..	103—104	+½	4 7 0
2,600,000	,,	,,	3½		3½ p.c. max.	..	88—89	..	3 18 8
3,799,735	,,	,,	4		4 p.c. Con. Pref.	..	105—107	+1	3 14 9
4,193,975	..	Dec. 11	3		3 p.c. Con. Deb.	..	85—86	..	3 9 9
258,740	Stk.	Mar. 12	6¾	Hastings & St. L. 3½ p.c.		..	93—95	..	5 0 0
82,500	,,	,,	6¼	Do. do. 5 p.c.		..	117—120	..	5 4 2
70,000	10	Oct. 15	11	Hongkong & China, Ltd.		..	18—18½	..	5 18 11
123,500	Stk.	Mar. 12	6½	Ilford "A" and "C"		..	134—136	..	4 15 7
65,781	,,	,,	5	Do. "B"		..	103—105	..	4 15 3
51,000	,,	Dec. 30	4	Do. 4 p.c. Deb.		..	102—104	..	3 16 11
4,940,000	Stk.	Nov. 13	8	Imperial Continental		..	183—185	+1	4 6 6
473,600	Stk.	Feb 11	3½	Do. 3½ p.c. Deb. Red.		..	95—97	..	3 12 2
195,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c.		..	117—119	..	5 0 10

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
561,000	Stk.	Feb. 25	10	Liverpool United A	222½—224½	..	4 9 1
718,100	,,	,,	7	Do. B	69½—171½	..	4 1 7
306 083	,,	Dec. 30	4	Do. Deb. Stk.	105—107	..	3 14 9
75,000	5	Dec. 11	6	Malta & Mediterranean	4¾—5	..	6 0 0
560,000	100	Apl. 1	5	Met of 5 p.c. Deb.	100—102	..	4 18 0
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 13	3½	Monte Video Ltd.	12½—12¾	..	5 9 10
1,775,892	Stk.	Feb. 25	4½	Newc'tle & G'tsha'd Con	107—108	..	4 3 4
518,595	Stk	Dec. 30	3½	Do. 3½ p.c. Deb.	91—93	..	3 15 3
15,000	10	Feb. 25	10	North Middlesex 10 p.c.	19⅜—20	..	5 0 0
55,940	10	,,	7	Do. 7 p.c.	13—13⅛	..	5 3 8
300,000	Stk.	Nov. 27	8	Oriental, Ltd.	140—142	..	5 12 8
60,000	5	Mar. 31	8	Ottoman, Ltd.	6—6¼	..	6 8 0
3,830	53	Feb. 25	13	Portsea Island A.	135—137	..	5 0 7
60,000	50	,,	13	Do. B.	129—131	..	4 19 3
100,000	50	,,	12	Do. C.	119—121	..	4 19 2
114,800	50	,,	10	Do. D and E.	101—103	..	4 17 1
398,490	5	Oct. 29	7	Primitiva Ord.	6⅛—6⅝	..	5 7 8
796,980	5	Jan. 28	5	Do. 5 p.c Pref.	5—5¼	..	4 15 3
488,900	100	Dec. 1	4	Do. 4 p.c Deb.	95—97	..	4 2 6
1,100,000	10	Oct. 15	8	River Plate Ord.	13¾—14¼	..	5 12 3
312,650	Stk	Dec. 30	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
250,000	10	Mar. 31	8	San Paulo, Ltd.	13¾—14	..	5 14 4
62,500	10	,,	—	Do. 6 p.c. Pref.	11⅛—12	..	5 0 0
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	49½—50½	..	4 19 0
135,000	Stk.	Mar. 12	10	Sheffield A	236—238	..	4 4 0
209,985	,,	,,	10	Do. B	236—230	..	4 4 0
523,500	,,	,,	10	Do. C	234—236	..	4 4 9
70,000	10	Oct. 29	10	South African	14—14⅜	..	6 17 11
6,429,895	Stk.	Feb. 11	5/6/8	South Met., 4 p.c. Ord.	123—124	..	4 6 0
1,895,445	,,	Jan 14	3	Do. 3 p.c. Deb.	85—86	..	3 9 9
209,025	Stk.	Mar. 12	8	South Shields Co. Stk.	152—154	..	5 3 11
605,000	Stk.	Feb. 25	5½	S'th Suburb'n Ord. 5 p.c.	120—122	..	4 10 2
60,000	,,	,,	5	Do. 5 p.c. Pref.	122—124	..	4 0 8
117,058	,,	Jan. 14	5	Do. 5 p.c. Deb. Stk.	124—126	..	3 19 4
502,310	Stk.	Nov. 13	5	Southampton Ord.	109—111	..	4 10 1
120,000	Stk.	Feb. 25	6⅔	Tottenham A 5 p.c.	132—134	..	5 0 9
423,940	,,	,,	5¼	and B 3½ p.c.	109—111	..	4 14 7
149,470	,,	Dec. 30	4	Edmonton 4 p.c. Deb.	101—103	..	3 17 8
182,320	10	,,	8	Tuscan, Ltd.	8⅝—9¼	..	8 13 0
149,900	10	Jan.	5	Do. 5 p.c. Deb. Red.	100—102	+1	4 18 0
236,476	Stk.	Feb. 25	5	Tynemouth, 5 p.c. max.	105—107	..	4 13 6
255,666	Stk.	Feb. 25	6½	Wands- B 3½ p.c.	131—133	..	4 17 9
79,416	,,	Dec. 30	3	worth 3 p.c. Deb. Stk.	72—74	..	4 1 1
835,872	,,	Feb. 25	5½	West Ham 5 p.c. Ord.	118—121	..	4 6 9
210,000	,,	,,	5	Do. 5 p.c. Pref.	125—127	..	3 18 9
253,300	,,	Dec. 30	4	Do. 4 p.c. Deb. Stk.	107—109	..	3 13 5

Prices marked * are "Ex div."

before they could make up their minds to have a railway siding constructed into the gas-works. They at last agreed to it, and the siding has been carried out. The troubles of the Corporation over the matter are not, however, at an end. The working of the siding is now the difficulty. The Caledonian Railway Company are willing to deliver loaded and to lift empty waggons at a certain point; but if they are asked to go beyond this point, they claim payment at the rate of 7s. per hour as the charge for shunting. The Gas Committee conducted all their negotiations on the footing that the Railway Company would deliver all goods at the gas-works without extra charge; and they recommended that a further meeting with the General Manager of the Railway Company be sought. This was agreed to. It was intimated that Messrs. Archd. Russell, Limited, had declined to put gas-fittings into houses at Portland Square belonging to them. The Committee agreed unanimously that the Council should not put in the fittings. Bailie Smellie considered this was a case of the community suffering between two conflicting interests. Mr. Gilmour moved that the matter be sent back to the Gas Committee for further consideration; and after further discussion, the Council agreed to adopt this course. Mr. F. Cassells moved that, in the opinion of the Council, the appropriation of gas-works profits for the erection of a new town hall or municipal buildings—a scheme not yet agreed upon—was illegal, unfair, and unjust to the present ratepayers, and should be discontinued; and that a Committee should be appointed to consider and report as to the best manner of distributing the sums already accumulated. These sums, he mentioned, amounted to £6760—made up of five yearly payments of £1250 from the gas-works profits, with the interest accrued. They had the opinions of the then Dean of the Faculty of Advocates (now Lord Skerrington), and of Mr. Fraser, that the procedure of the Council in regard to the new town hall was entirely illegal; and even the eminent Counsel consulted by the Town Council had distinctly informed them that there were grave doubts as to the legality of their procedure. Ex-Provost Keith moved that the Assessment Committee, when framing their next annual budget, consider whether the sums already accumulated from the gas profits might be utilized for the redemption of municipal debt and the reduction of rates. Mr. Moffat seconded. Mr. Cassells then withdrew his motion, and accepted that of ex-Provost Keith, which became the unanimous finding of the Council.

In the Dysart Town Council last week, reference was made to a complaint by the Gas Company to the effect that the governors on several of the street-lamps had been tampered with by burgh servants. The Town Clerk read a further letter from the Secretary to the Gas Company, in which it was stated that the Town Clerk's reply had been submitted to a meeting of the Directors. In his reply, the Town Clerk had stated that the Council had been unable to find the town's servants at fault; but the Secretary wrote that the information was not given which enabled the Council to come to this finding. He asked that if the town's servants who were responsible had made some statement, the Council should communicate that information to the Directors. The Council, the Secretary's letter went on to state, were of opinion that there would be no advantage in prosecuting the matter further; but the Directors took an altogether different view, and could not allow the matter to rest. This letter having been read, the Town Clerk said they would give the Company all the information they had, if the Company would consent to do likewise. The subject was thereupon allowed to drop.

A meeting of the Gas Committee of the Dumfries Town Council was held on Thursday of last week to consider as to the gas managership, which is vacant through the death of Mr. G. Malam. The meeting, it is reported, lasted an hour-and-a-half, and was at times of a lively character. A motion by Provost Lennox to bar canvassing was carried. A good deal of discussion took place as to the salary to be offered—£300 and £350 being suggested. It was, however, agreed to obtain information as to the salaries paid to gas managers in towns of similar size before coming to a finding. Mr. Smith, the foreman in the gas-works, and Mr. Dickie, another employee—cashier, I think—who are both candidates for the post, were appointed to take charge of their respective departments in the meantime. It was decided to recommend the Council to advertise the situation.

Suicides by Coal Gas.

At Paddington, a few days ago, Dr. Danford Thomas inquired into the death of Rebecca Whur, aged 55, widow of a shop manager, who committed suicide at her home in the Harrow Road by inhaling gas. Mrs. Clemens, wife of the Rev. Arthur Clemens, Vicar of St. Paul's Church, Paddington, said she went to visit deceased on the previous Monday evening, and found her room full of gas. After having all the windows opened and the lights put out, she went into the room and found two gas-jets turned on, and the deceased lying on the floor with a sheet covering her face and also a gas-ring, the tap of which was turned on. A medical man deposed that death was due to coal gas poisoning, and said he had no doubt it was due to deceased's deliberate act. The Jury returned a verdict of "Suicide while of unsound mind." William Piercy Brocklehurst, aged 73, whose death was investigated by the Hornsey Coroner on the 10th inst., committed suicide at his house on Station Parade, Muswell Hill. He was a retired ironmonger, and for some time had been depressed; but on the morning of his death he appeared to be in good spirits. Shortly afterwards, however, he was found sitting dead in an arm-chair, with the rubber pipe from a gas-stove passed under his waistcoat to his mouth. The verdict was "Suicide while of unsound mind." An inquest was held in Dublin on Monday last week on James Parker, aged 32, a native of Manchester, who was found dead in a boarding-house at Fairview. Mr. Isaac Whittaker, of Salford, identified the body as that of his son-in-law. The landlady said that on the previous Saturday deceased seemed depressed. On Sunday morning she detected a strong smell of gas, and found Parker lying with his head near the gas-meter pipe, which had been cut, while the keyhole of the door and other openings had been blocked up. A verdict of "Suicide during temporary insanity" was returned.

The "New Davis" Screwless Cooker

has many claims on the favourable consideration of every Gas Undertaking. Here are a very few of them:—

¶ It has proved itself **Unique from a Maintenance Point of View.**

¶ It has an Improved Grill Burner and Grill Pan—virtually a small oven—giving **25% increase in efficiency.**

¶ A new method of Gas and Air supply to the Oven, with Patent Adjusters **securing perfect combustion and simplicity in operation.**

¶ An Enamelled Tray of **Unique and Novel Construction.**

¶ It **looks** so attractive—the first impression created is always favourable!

The DAVIS GAS STOVE CO., Ltd.,

Diamond Foundry, LUTON.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *April* 17.

Holidays have rather interfered with business; but, on the whole, the market has been fairly well sustained. Prices have, however, been somewhat irregular, partly owing to special demand at some ports, and partly to a certain amount of reselling at others. Home demand has again been good. The closing quotations are £11 8s. 9d. per ton f.o.b. Hull, £11 10s. to £11 11s. 3d. per ton f.o.b. Liverpool, and £11 12s. 6d. to £11 15s. per ton f.o.b. Leith. There continues to be inquiry for forward delivery; but the attitude of makers does not encourage much business. £11 12s. 6d. to £11 15s. per ton, according to port, is still required, but so far not reported paid, for July-December delivery; while for January-April, 1910, £12 is being quoted f.o.b. best ports.

Nitrate of Soda.

The spot market has been fairly well occupied, and the quotations remain 10s. 4½d. and 10s. 7½d. per cwt. for 95 per cent. and refined qualities respectively.

Tar Products. LONDON, *April* 19.

The majority of tar products are quiet, with the exception of pitch and creosote. There is a slight improvement in the price of the former at all points. With regard to creosote, there have been several sales made during the last few days, which, however, has not strengthened the price. But there are still a good many inquiries in the market; and, with the busy season approaching, we may possibly see an improvement. No fresh sales of material importance are reported in 90 per cent. and 50-90 per cent. benzol, which are very weak. Crude carbolic dealers are still paying better prices than those being offered by consumers.

The average values during the week were: Tar, 13s. 3d. to 17s. 3d., *ex* works. Pitch, London, 24s. to 24s. 6d.; east coast, 23s. 6d. to 24s.; west coast, 23s. to 24s. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 6d.; North, 5½d.; 50-90 per cent., casks included, London, 6½d.; North, 6d. Toluol, casks included, London, 8½d.; North, 7½d. to 8d. Crude naphtha, in bulk, London, 3½d. to 3⅝d.; North, 3d. to 3⅛d.; solvent naphtha, casks included, London, 10½d. to 11d.; North, 9d. to 9½d.; heavy naphtha, casks included, London, 11d. to 11½d.; North, 10d. to 10½d. Creosote, in bulk, London, 2⅝d. to 2⅝d.; North, 2½d. to 2⅝d. Heavy oils, casks included, 3d. Carbolic acid, 60 per cent., east coast, 1s. 0½d. to 1s. 0⅝d.; west coast, 1s. to 1s. 0¼d. Naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1⅝d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market for this article is steady, but the demand is quiet, though, with the better weather setting in, it is considered that in some cases the price may improve a little. To-day for Beckton prompt, the price is £11 17s. 6d.; and on Beckton terms, £11 7s. 6d. to £11 10s. In Hull, £11 7s. 6d. to £11 10s. is quoted; and in Liverpool, £11 10s. to £11 12s. 6d. In Leith, £11 12s. 6d. to £11 15s is the price asked.

COAL TRADE REPORTS.

Northern Coal Trade.

There is now an active coal market, and for some classes of fuel the demand seems to be brisker, with a tendency towards higher prices. In steam coal, the output is again normal; and, with good shipments, it is well taken up. The prices range for best Northumbrians from about 11s. 9d. to 12s. 6d. per ton f.o.b. For second-class coals, from 9s. 6d. to 10s. 6d. is quoted; and the demand for steam smalls appears to be stronger—from about 5s. to 6s. In the gas coal trade, there is rather more briskness than is usual at this season of the year; and the prices are firm. Durham gas coal varies from about 9s. to 10s. 3d. per ton f.o.b. for the usual classes, according to quality, with "Wear specials" from about 3d. to 6d. per ton higher. Contracts reported are few; but it is said that some sales for the Mediterranean have been made, though there are also rumours of some competition in these markets with fuel from competing coalfields. As it is, however, there is still a strong inquiry for Durham gas coal for the Italian markets. Coke is steadier, and gas coke is in fair demand. The lessening output helps to give firmness to the price—at from about 12s. 9d. to 13s. 3d. per ton f.o.b. for good gas coke.

Scotch Coal Trade.

Trade is not healthy; the home request being slack. There is a slight improvement in foreign demand, due to the expectation of the opening of the Baltic trade, and also on account of the circumstance that during Easter week English vessels catered for Scotch traffic. The prices quoted are: Ell 8s. 9d. to 10s. 3d., splint 9s. 6d. to 9s. 9d., and steam 9s. to 9s. 3d., per ton f.o.b. Glasgow. The shipments for the week amounted to 303,671 tons—an increase of 26,946 tons upon the preceding week, and of 29,288 tons upon the corresponding week of last year. For the year to date, the total shipments have been 3,584,532 tons—an increase of 280,183 tons upon the corresponding period.

We have received from John Wright and Eagle Range, Limited, their latest summer booklet, furnishing illustrated particulars of their "Eureka" gas-cooker and "Sun" boiler. The former appliance is well known. The unique feature of the latter is its automatic valve, which turns the gas down as soon as the water is raised to the right temperature, and restores the full supply when the heat is lowered, by the admission of cold water. The booklet contains a view showing how the boiler may be used in conjunction with the coal-range boiler.

MILES PLATTING,
MANCHESTER.

SAWER and PURVES.

PREPAYMENT METERS.

RADFORD ROAD,
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New Joint-Stock Companies.

The Hella Bushlight and Methane Gas Company, Limited, was registered on the 7th inst., with a capital of £170,000, in £1 shares, to acquire certain inventions for the manufacture of pure methane, or a mixture of gas rich in methane; for the manufacture of radiant, refractory, and indestructible filaments for the manufacture of incandescent mantles or bushes; and for all kinds of lighting and heating by gas, alcohol, acetylene, petrol, oil, and other modes; also for certain machinery for improvements in the manufacture of incandescent filaments, together with the patents granted, or to be granted, in respect thereof for the United Kingdom and all British colonies and dependencies (except Canada), together with the business of the Universal Gas Methane and Buisson Hella Company, Limited, in those countries (except Canada); to adopt agreements (1) with the Company and R. Laigle and (2) with G. Auger, &c. Under the title of Machine Gas, Limited, a Company has lately been registered with a nominal capital of £25,000, divided into 19,700 ordinary and 5300 deferred shares of £1 each, to manufacture, buy, sell, let on hire, and deal in machinery, pipes, fittings, &c., for the manufacture, distribution, and utilization of gas and light; to manufacture, sell, and deal in all kinds of gas and light; and to prosecute enterprises of any description having the objects of the Company. There are two subscribers—one being Mr. A. C. Ionides, who holds 500 ordinary shares, and the other Mr. A. J. M. Duncan, who has one share. The public generally are not invited to subscribe. The number of members of the Company (exclusive of employees) is limited to 50. The Wedmore Gas Company, Limited, has been formed with a capital of £3000, in £5 shares, to adopt an agreement with Mr. G. C. Swayne, and to manufacture and supply light and fuel in Wedmore and elsewhere, in Somerset. The Novalux Syndicate, Limited, has been registered with a capital of £25,000, in 24,725 ordinary shares of £1 each and 5500 founders' shares of 1s. each, to adopt an agreement and to acquire a licence conferring the right to sell in Great Britain and the Colonies certain appliances for lighting and extinguishing gas-lamps. The Water Circulating Gas-Cooker, Limited, has been registered with a capital of £60,000, in £1 shares.

Walsall and a Gas Supply for Pelsall.—With reference to a proposal to extend the Walsall gas-mains to Pelsall, the Gas Committee have instructed the Town Clerk to inform the Clerk to the Pelsall Parish Council that as 48 persons only had agreed to take the gas in case the mains were extended, they do not consider that they would be justified in recommending the extension; but that if about three times that number would agree to do so, the Committee would favourably reconsider the matter. The consideration of the question of extending the gas-mains to Shelfield has been ordered to stand over until the Brownhills Urban District Council have reported the result of their canvass of the inhabitants to ascertain the number of persons who will take gas.

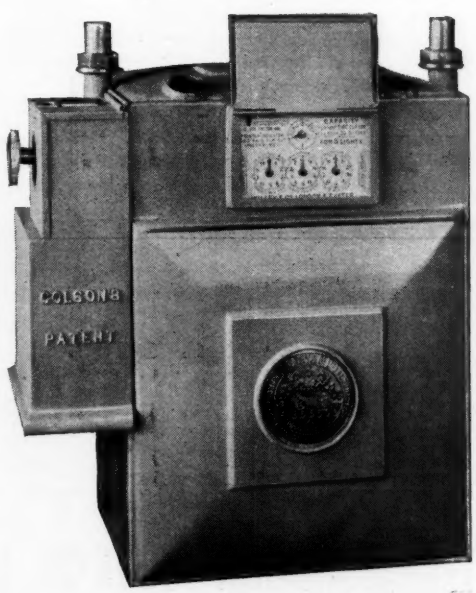
Cookery Competition for Girls at Port Elizabeth.

Mr. William Arnott, the ever-active Manager of the South African Lighting Association, recently arranged some cookery competitions for girls which were attended by highly successful results. He offered two prizes for the best set of four scones, and a like number for the best set of four queen cakes, made by girls of sixteen and under with the aid of a gas cooking-stove. The offer was well advertised, and no fewer than 70 sets were sent in. The awards were made by a Committee of ladies, who found it very difficult to place them owing to the general high merit of the articles submitted. The winner of the first prize for scones was a girl of fourteen who had been successful on a previous occasion; the second prize being carried off by a girl of the same age. Another girl of this age gained the first prize for queen cakes; and one a year younger secured the second prize. The scones and cakes were exhibited in the Company's show-rooms, and afterwards sent to the Children's and Nazareth Homes. Mr. Arnott invited people to come to the rooms and see what gas cookery could do, even when children were the cooks; and then recommended them to have gas-stoves fixed for themselves, and make use of them, as many of their fellow townspeople had done. On a subsequent occasion, he gave a demonstration in toast-making by means of a gas-ring and a "Sala" toaster costing 1s. 6d. Cookery is taught in many of the schools in Port Elizabeth; and Mr. Arnott is determined that the value of the gas-stove as an auxiliary shall not be lost sight of.

Gas Profits at Stafford.—The Stafford Corporation Gas Committee estimate that out of the profits of the Gas Department for the year ended the 31st ult., the sum of £3000 will be available in aid of the district funds.

Fires in the City of London.—A report recently issued shows that during the past year there were 134 outbreaks of fire in the City of London. Of this number, 16 were caused through the agency of gas, and 11 by electric current. The outbreaks caused by gas are tabulated as follows: Ceiling fired by gas-jet, 1; curtains or blinds fired by gas-light, 3; escapes of gas, 3; seeking gas escapes with naked light, 2; defective gas-meter, 1; gas-stoves, 9. The fires caused by electric current were all due to defective circuits.

Lecture on the Divining-Rod.—"Water Divining at Home and Abroad, or the History of the Divining-Rod," was the subject of a lantern lecture given in the St. Lawrence Hall, Ipswich, by Mr. S. T. Child, on Monday evening last week. Many instances were given of work done in the immediate neighbourhood; also on the King's estate at Sandringham. The main part of the lecture consisted of instances of water finding during the visit of Mr. Child to Portugal. In cases where villages had been entirely without water for some time, and large numbers of the villagers had died from thirst, the lecturer related how he had been able to locate where water could be found. He said it was quite by accident he found he possessed this gift.



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Failure of the Electric Light in Belfast.—Just before 3 o'clock last Tuesday morning, the whole of the public departments in Belfast were thrown into complete darkness by the sudden total failure of the electric light supply at the Post Office, the Fire Station, the Central Police Office, and the Telephone Exchange. The collapse momentarily created a feeling of consternation; but, fortunately, in nearly every instance recourse was had to emergency gas installations. There was no accident at the electric light station; the cause of the failure being the breaking of one of the main cables.

Gas Prices and Profits.—The current number of the "Municipal Journal" contains a leaderette dealing with the portion of the Inaugural Address of Mr. W. Langford at the recent meeting of the Midland Association of Gas Managers, in which he commented upon the unfairness of reducing rates out of profits. "The figures quoted by Mr. Langford," says our contemporary, "show that an extra, and quite unjustifiable, tax is imposed upon gas consumers by the Longton Corporation. If the Council supplied gas at practically cost price, the demand would be increased, and the supply might be developed in many directions. We are glad to think that, after many years' agitation in regard to this matter, the principle of selling at cost price has been incorporated in the Act of Parliament federating the Potteries towns. There is also a notable change of public opinion in the country on the subject; and we confidently expect that even Manchester, with its £50,000 and £60,000 yearly rate relief from gas profits, will shortly repent, and tread the path that leads to sound municipal economy."

Poisoning by Coal Gas.—A remarkable death from poisoning by coal gas was inquired into last Friday by the Portsmouth Coroner. On the previous Tuesday evening, the open door of an empty house at Copnor attracted notice; and on the premises being entered it was found that a considerable escape of gas was taking place from a small cupboard at the rear, and a man was lying at full length at the entrance. He was quite insensible; and though efforts were made to restore animation by artificial respiration, he died on the spot. The escape of gas was so great that it could only be stopped by opening the ground in front of the house and capping the supply-pipe. The deceased was Ernest Fairburst, 34 years of age, a fitter in the employ of the Portsea Island Gas Company, and in the course of reinstating a service-pipe to the meter, it was conjectured that the rush of gas was so great when the old cap was removed that he was overpowered and suffocated in the darkness in which he was working. A verdict of "Accidental death" was returned; the Jury adding a rider to the effect that in all future work of such a kind two men should be employed.

Gas v. Electricity for Park Lighting at Bath.—At the last meeting of the Bath Town Council, a discussion took place on the subject of the lighting of the Victoria Park on the three nights weekly during thirteen summer weeks when a band plays. It appears that the Electric Light Committee submitted to the Park Committee an offer to supply and light 38 100-candle power lamps for 2s. per hour, if the latter Committee would pay a sum of upwards of £600 to meet the initial outlay for mains, lamps, &c. The Bath Gas Company offered an inclusive charge of £40 per annum to light 35 250-candle power lamps for two hours per night three nights weekly for the season, with an additional charge of 6s. for each extra night. When the Park Committee met to consider the tenders, the Electric Light Committee sent in a revised offer of an inclusive charge of £60; but at the same time the Corporate Property Committee offered them, on behalf of the Corporation, a grant of £60 a year if electricity was used. After some consideration, the Park Committee decided in favour of lighting by gas, and asked for a grant of £40 only, instead of the £60 offered; being a saving to the ratepayers of £20 per annum.

APPLICATIONS FOR LETTERS PATENT.

8075.—SOUTHEY, A. W., and the DUDBRIDGE IRON-WORKS, LTD., "Lamps and stoves." April 5.
8149.—GRAETZ, M., "Regulating device for gas-nozzles." April 5.
8165.—SPENCER, A., "Controlling the supply of gas to railway carriages." April 5.
8201.—BEDFORD, C. S., and ATKINS, F., "Producing liquid or gas tight joints upon cylinders." April 6.
8229.—DEMPSTER, R., AND SONS, LTD., BROADHEAD, J. W., and TOOGOOD, H. J., "Manufacture of gas." April 6.
8243.—HETHERINGTON, R., and TAYLOR, J., "Governing the flow of gas from meters." April 6.
8269.—PEACOCK, J. H., and TOPLIFF, F., "Gas-turbine." April 6.
8309.—DAVIS, H. N., and TWIGG, W. R., "Gas-fires." April 6.
8318.—GREENER, T. Y., THOMPSON, W., and MORGAN, J., "Reciprocating trough conveyors for coal." April 6.
8332.—VANDERLIP, L. C., "Gas-engines." April 6.
8396.—STORRER, H., "Measuring the difference in gas pressures." April 7.
8445.—KIESSELBACH, C., "Controlling gas-engines." April 7.
8449.—CHIPPERFIELD LAMP SYNDICATE, LTD., and BROWNING, E. M., "Suspension of street and other lamps." April 7.
8450.—CHIPPERFIELD LAMP SYNDICATE, LTD., and BROWNING, E. M., "High-pressure gas-lamps." April 7.
8476.—DEMPSTER, R., AND SONS, LTD., and TOOGOOD, H. J., "Gas-retorts." April 8.
8481.—BLAKELEY, W., "Washing, cooling, and heating of gases and liquids." April 8.
8499.—LEE, J. G. S., "Gas-bag for use when testing mains." April 8.
8504.—NEWMAN, F. L., "Full-bore valves." April 8.
8551.—RORKE, T. J. & E., "Controlling the supply of gas." April 8.
8558.—PARKER, T., "Destructive distillation of coal." April 8.
8572.—WEST, J., and GLOVER, S., "Vertical retort discharging apparatus." April 8.
8575.—HANWELL, H. W., "Gas-pendants." April 8.
8632.—BREEDEN, J., AND CO., LTD., and BREEDEN, F., "Joints of gas-brackets." April 10.
8651.—HELPS, G., "Gas lamps and burners." April 10.

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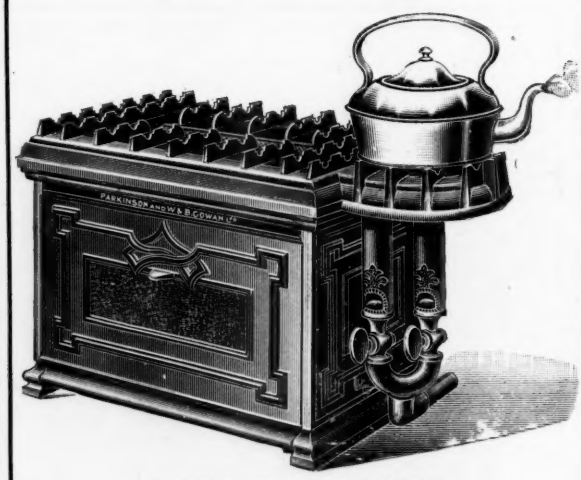

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Extended Gas Powers for the Coventry Corporation.—The Local Government Board have directed an inquiry to be held by Mr. F. J. Willis into an application by the Coventry Corporation for a Provisional Order to partially repeal, alter, or amend several of their Gas Acts, so as to enable them to inspect fittings in new buildings, require consumers to use effective anti-fluctuators or other apparatus for controlling and regulating the supply of gas to engines, and provide that gas-fittings, stoves, and cookers let on hire by the Corporation shall not be subject to distraint. It is further proposed to substitute improved methods of testing the illuminating power of the gas.

Increased Storage at the Arbroath Gas-Works.—After considerable negotiation, the Corporation of Arbroath have secured ground adjoining the gas-works upon which to erect a new gasholder, the contracts for which were let some time ago; and the work of erection will now be proceeded with. Provost Alexander, at a recent meeting of the Gas Committee, said they had had some difficulty in arriving at an agreement, and eventually they had to acquire a good deal more ground than they wished. Although it entailed a considerable feu-duty, it was very much cheaper than buying property, and they could sell or sub-feu what they did not require. On the whole, he thought, they had made a favourable bargain. The price was a good deal less than the Manager at one time thought they would have to pay.

The Directors of the Oriental Gas Company, Limited, have resolved to pay an interim dividend at the rate of 3½ per cent., free of income-tax, on account of the year ending the 30th of June next.

A Local Government Board Inquiry has been held at Dorrington, near Sleaford, with regard to an application by the Sleaford Rural District Council for sanction to borrow £1000 for water-works at Dorrington.

For the purpose of centralization, Messrs. Thomas Glover and Co., Limited, have decided to move their head office staff from their City address to their works at Edmonton. In future, all communications should be addressed to Gothic Works, Angel Road, Edmonton, N. Messrs. Glover intimate, however, that their City office and showrooms are still being retained.

At the last meeting of the Coleraine Town Council, tenders were considered for the supply of a supplementary cargo of coal, to complete the season's requirements; and it was decided to order 150 tons of Wrexham coal from the G. J. Eveson Coal and Coke Company, Limited, of Birmingham.

The Manchester Water Committee have decided to obtain tenders for the laying of a third line of pipes from Thirlmere, in the district between Windermere and Carnforth, a distance of 14 miles. They have also resolved to invite tenders for 40-inch pipes for use in the southern district between Walkden and Denton.

Last Friday an explosion took place in an Oldham street, through an accumulation of gas in an electric cable conduit. The footpath was greatly disturbed; and one man who happened to be passing at the time was slightly injured. The escaping gas was allowed to burn out, in order to obviate the risk of further explosions.

The Manchester police some days ago arrested a man named Moorhouse, who until recently was an employee of the Belfast Gas Department, on a charge of having misappropriated money belonging to the Council of the County Borough of Belfast. The accused, who was employed in the capacity of a timekeeper at the works in Ormeau Road, disappeared some months ago; and though immediately on the alleged defalcations being discovered steps were taken to ascertain his whereabouts and to execute the warrant which was duly issued, these had hitherto proved unsuccessful. It is understood that the amount involved is about £160.

The Directors of Messrs. Newton, Chambers, and Co., Limited, state in the annual report that, after allowing for depreciations, there is a profit of £39,130, making, with £11,459 brought forward, £50,590. Out of this there has been paid to the holders of debenture bonds and the mortgagees, for interest, £3501; and further sums have been set aside of £5000 towards the outlay on the new coke-ovens and £10,000 in respect of expenditure on the iron-works—leaving an available balance of £32,089. This the Directors recommend to be applied as follows: Payment of 6 per cent. on 7348 preference shares of £20 each, and 6 per cent. on 7975 ordinary shares of like nominal value; carrying forward a balance of £13,701.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

DISTRIBUTION SUPERINTENDENT. Hythe and Sandgate Gas Company.
METER, &c. INSPECTOR. Grantham Gas Company.
MOND GAS PLANT ATTENDANT. The Power Gas Corporation.
SHOW-ROOM SALESMAN. Sutton Gas Company. Applications by April 24.
TRAVELLER (GEYSERS). No. 5383, c/o Willing's.

Situations Wanted.

GAS-FITTER. No. 5086.
REPRESENTATIVE (GAS PLANT, &c.). No. 5084.
SECRETARY, MANAGER OR ACCOUNTANT. Mimmack, St. Paul's Cray, Kent.

Plant, &c. (Second-Hand), for Sale.

EXHAUSTER. J. Hawksley, Great Yarmouth.
PURIFIERS, &c. Uxbridge Gas-Works.
RETORT FITTINGS, CONDENSER, SCRUBBERS, EXHAUSTERS, PURIFIERS. Cardiff Gas Company. Tenders by May 1.

Patent Licences.

MANTLE MANUFACTURING MACHINES. Haseltine, Lake, and Co., Southampton Buildings, W.C.

Capital to Invest (Gas or Water Company).

No. 5085.

Stocks and Shares.

ASCOT DISTRICT GAS AND ELECTRICITY COMPANY. April 27.
BROMLEY AND CRAYS GAS COMPANY. May 11.
CROMER GAS COMPANY. May 11.
EASTBOURNE GAS COMPANY. May 11.
GRAYS AND TILBURY GAS COMPANY. April 27.
GUILDFORD GAS COMPANY. May 11.
HORNSEY GAS COMPANY. May 11.
ILFORD GAS COMPANY. May 11.
KIRKHAM, HULETT, AND CHANDLER. April 27.
LEA BRIDGE GAS COMPANY. May 11.
MAIDSTONE GAS COMPANY. May 11.
PINNER GAS COMPANY. May 11.
ROMFORD GAS COMPANY. May 11.
SOUTHEND GAS COMPANY. May 11.
SOUTHEND WATER COMPANY. April 27.
SOUTHGATE GAS COMPANY. May 11.
WANDSWORTH AND PUTNEY GAS COMPANY. May 11.

TENDERS FOR

Benzol (Crude).

BRIDGEWATER COLLIERIES COKE-WORKS. Tenders by April 26.

Coal and Cannel.

BANGOR (N.W.) GAS DEPARTMENT. Tenders by April 30.
BLACKPOOL GAS DEPARTMENT. Tenders by April 25.
CARLISLE GAS DEPARTMENT. Tenders by April 30.
EAST RETFORD GAS DEPARTMENT. Tenders by April 30.
EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS. Tenders by April 26.
HEREFORD GAS DEPARTMENT. Tenders by May 2.
HEYWOOD GAS DEPARTMENT. Tenders by May 11.
MOSSLEY GAS DEPARTMENT. Tenders by April 28.
SUTTON, REIGATE, AND NEWHAVEN GAS COMPANIES. Tenders by April 24.

Governors.

DEVONPORT GAS DEPARTMENT. Tenders by May 8.

Oxide of Iron.

BLACKBURN GAS DEPARTMENT.

Pipes, Pipe-Laying, &c.

TAUNTON RURAL DISTRICT COUNCIL. Tenders by April 30.

Reservoir Construction.

TAUNTON RURAL DISTRICT COUNCIL. Tenders by April 30.

Sulphuric Acid.

BROADSTAIRS GAS COMPANY. Tenders by May 4.

Tar.

BANGOR GAS DEPARTMENT. Tenders by April 30.
MITCHAM AND WIMBLEDON GAS COMPANY. Tenders by April 30.
SUTTON, REIGATE, AND NEWHAVEN GAS COMPANIES. Tenders by April 24.
ULVERSTON URBAN DISTRICT COUNCIL. Tenders by April 29.

Valves and Hydrants, &c.

DEVONPORT GAS DEPARTMENT. Tenders by May 8.
TAUNTON RURAL DISTRICT COUNCIL. Tenders by April 30.

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COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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